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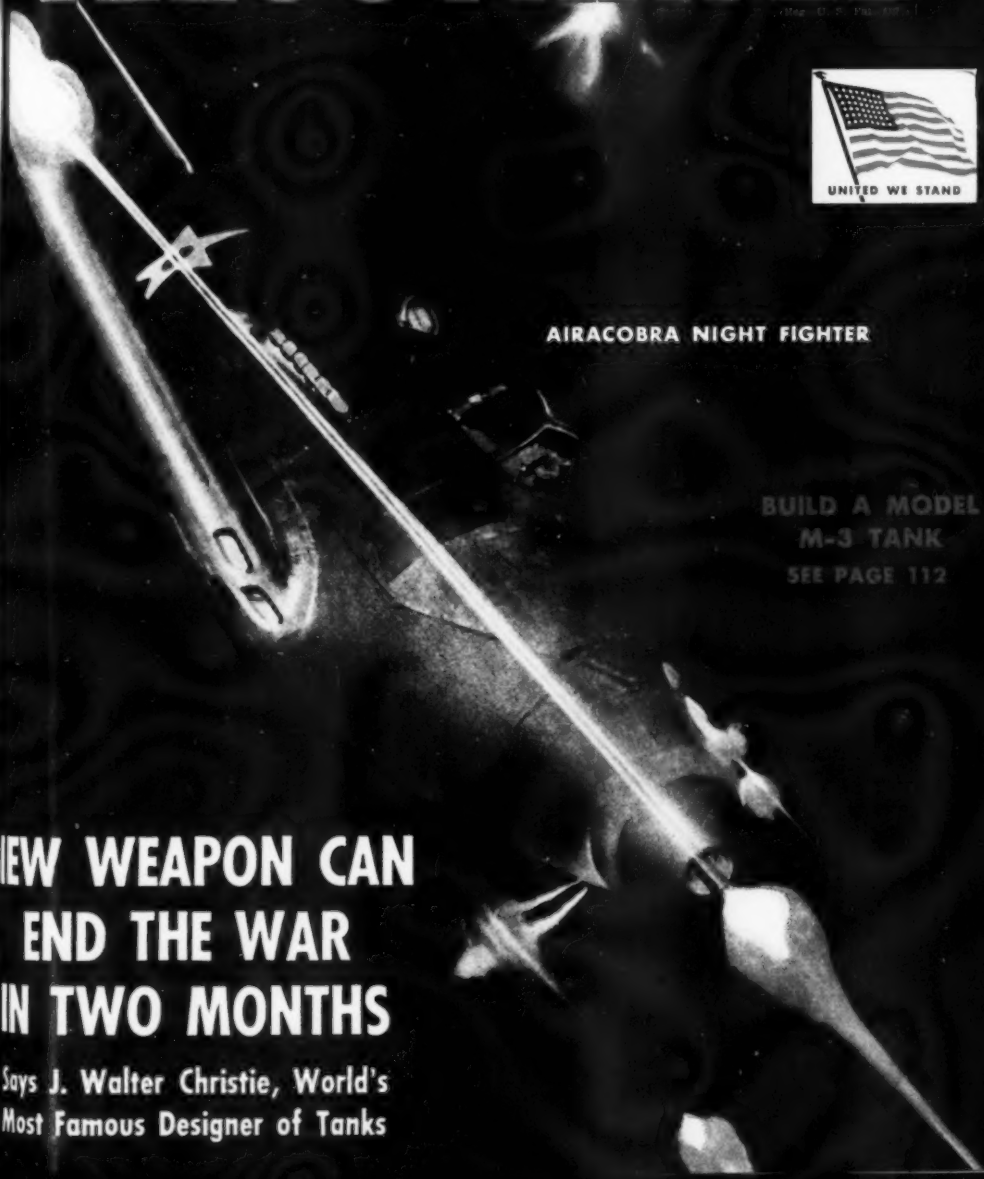

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AUGUST 1942

MECHANIX ILLUSTRATED

VOL. XXVIII NO. 4

W. H. FAWCETT, JR., President

Editors: Roland Cueva Bill Williams

Associate Editors: George Daniels, *Aviation;* Norman C. Lipton, *Photography;* Charles D. Bonsted, *News;* Shirley Cutter, *Production*

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Famed for years among air-minded Americans for his forward-looking aircraft designs, Major Alexander P. de Seversky last spring published *Victory Through Air Power* in which he set forth for every citizen the fabulous possibilities of global air power which, he charges, many of those now directing the U. S. air program still fail to grasp. A sensation on all sides, the critical, prophetic book leaped to the best-seller list, stayed there for weeks. Now Major de Seversky speaks out again in an article, *The Plane of Tomorrow*, in next month's issue of MECHANIX ILLUSTRATED. It is, we venture, the most important and significant discussion it has ever been our good fortune to bring to MI readers. To be sure not to miss it, reserve your copy of the September issue NOW!

MECHANIX ILLUSTRATED is published monthly by Fawcett Publications, Inc., 1100 W. Broadway, Louisville, Ky. Printed in U. S. A. Advertising and Editorial Offices, Paramount Building, 1501 Broadway, New York, N. Y. General Offices, Fawcett Building, Greenwich, Conn. Elliott D. Odell, Advertising Director; Roscoe K. Fawcett, Circulation Director; Ralph Daigh, Editorial Director; Al Allard, Art Director. Entered as second-class matter at the post office at Louisville, Ky., under the act of March 3, 1879. Additional entry at Greenwich, Conn. Copyright 1942 by Fawcett Publications, Inc. Reprinting in whole or in part forbidden except by permission of the publishers. Title registered in the U. S. Patent Office. Address manuscripts to New York Editorial Offices. Not responsible for lost manuscripts or photos. Unacceptable contributions will be returned, if accompanied by sufficient first class postage. Price 10c per copy. Subscription price $1.00 per year in U. S. and possessions. Canadian subscriptions not accepted. Foreign subscriptions $2.00 per year. Foreign subscriptions and sales should be remitted by International Money Order in United States funds payable at Greenwich, Conn. Advertising forms close fifth of second month preceding date of issue.

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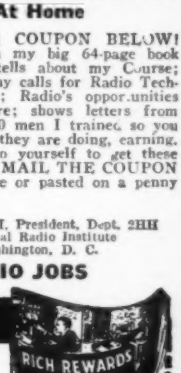

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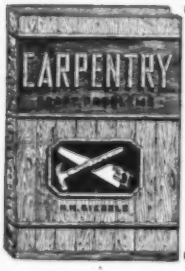

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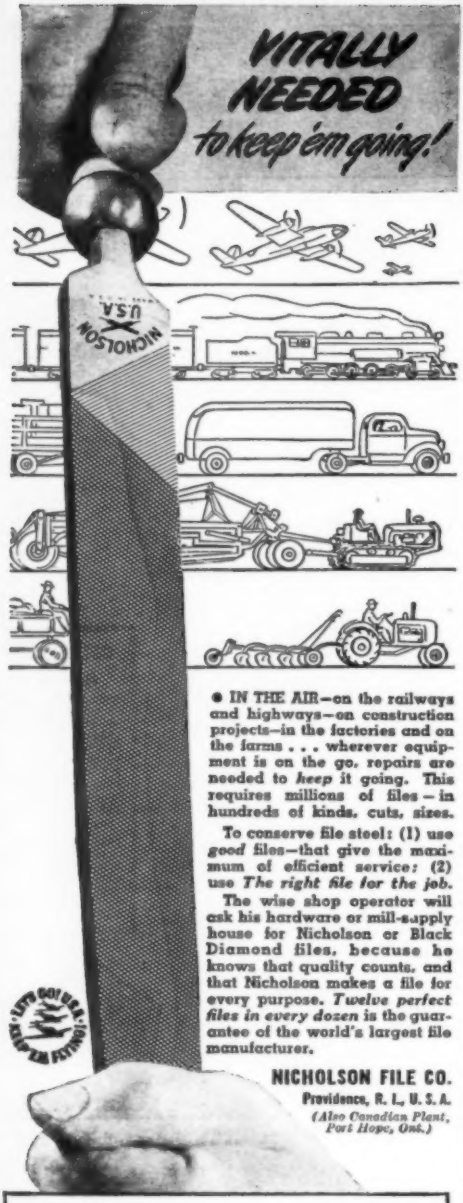

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GOSSIP OF DEFENSE AND INVENTORS

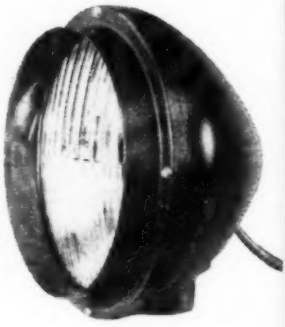
by Morton Leese

Grapefruit, orange and other citrus fruit juices can be prepared for canning or bottling more cheaply, yet without the rank, oily taste that many persons find objectionable in some commercially prepared juices, after a skin-scorching process on which U. S. patent 2,283,290 has recently been issued to B. N. Savage of Seattle.

Mr. Savage has discovered that the skin oil can be eliminated if the fruit is subjected for a short period to a relatively high temperature. In practice, he rolls the fruit through a brick furnace where gas blast-flames play on them for from five to fifteen seconds, at a temperature between 1,500 and 2,000 degrees Fahrenheit.

The fruit comes out with skins blistered and blackened, but with the strong-flavored oil all gone. Incidentally, dirt, fungus spots and all traces of insect life are also removed by the same treatment. The scorched surface is cleaned off by means of brushing or high-pressure water-jets, and the fruit is ready for the crusher.

This device, recently placed on the market, foils tire thieves who attempt to steal the entire wheel. The protective devices are available in sets of five, for running wheels and one spare. They are simply mounted so as to encase one wheel nut on each wheel. The owner can quickly remove them by using either of a pair of threaded keys supplied with the set. A wheel wrench is all that is needed for mounting them.



This newly introduced blackout type headlight for civilian automobiles provides both normal driving illumination and blackout illumination. A three-point switch enables the driver to change from the normal driving light to the blackout light. The blackout beam is strong enough to permit driving at speeds of from 15 to 20 miles an hour, but it cannot be seen from the air above 6,000 feet at night.

* * *

Garlic Seed Remover

Belying common belief that Gallic taste runs to garlic, three Frenchmen have invented a machine for separating seed of garlic, which grows as a weed in much European grain, from flour in the intermediate, coarse-meal stage of grinding. Two grooved rollers pick out the guilty, strong-scented seed and let the ground [*Continued on page* 11]

Three years of research and experiment preceded the introduction of this improved plastic cork coating for pipes. The purpose of the coating is to prevent dripping from condensation on the pipes, sometimes called "sweating." It is spread ¼ inch thick over any metal, concrete, plaster, tile, wood, composition, or painted surfaces, and can be painted any color. An ordinary brush is used to apply it as shown in photo.

New Products And Inventions

[*Continued from page* 10]

grain pass. The inventors, who received patent 2,283,449, are Charles Meneux of Nantes, Sylvain G. Bourdin of Angers and Louis Chausse of Nantes. They applied for their patent in March 30, 1940, not long before France's real troubles began.

* * *

Walnut Shells In Insecticide

Using an orchard waste as part of a protector for orchards, Forrest M. McLane of Montebello, Calif., has developed an insecticide in which walnut-shell flour is a carrier for the powerful insect-killing chemical, rotenone. To the rotenone-impregnated shell-powder is added a certain quantity of a non-volatile, non-drying oil as an emulsifier, together with some diatomaceous earth as a filler. The whole is suspended in water and used as a spray. Patent 2,283,275 covers this mixture.

* * *

Improvement In Shells

Shells of a quite different kind are the subject of patent 2,283,224, granted to Harry J. Nichols of Binghamton, N. Y. Specifically, his invention concerns the manner of applying the copper rotating band to the base of projectiles.

In ordinary ordnance manufacturing practice, this necessary copper ring, which engages the grooves in the rifled gun and spins the projectile on its axis, is slipped over the shell and hammered or pressed home with powerful machinery. Mr. Nichols states that he can save time and metal, and hence money, by forming the band by electro-deposition, then machining it down to the proper caliber.

* * *

Compressed-Air Shotgun

A weapon of less warlike intent is offered by Perry F. Vincent of Hillsdale, Mich., for patent 2,283,300. It is a shotgun "fired" with compressed air, intended primarily for purposes of target practice. Compressed-air weapons of shotgun caliber have not been very successful hitherto, the inventor explains, because it has not been possible to admit the air charge into the discharge chamber suddenly enough to obtain an explosive effect. He accomplishes this by using a heavy, hard-hitting hammer to strike the release valve.

* * *

Auxiliary Plane Wing

A German effort to solve the problem of giving a heavily loaded airplane extra wing surface to get it off the ground, then disburdening the plane of the surface when it is no longer needed, is represented in patent 2,283,223, issued to Fritz Nallinger of Stuttgart and assigned to the Daimler-Benz

[*Continued on page* 147]

INVENTORS

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Chips from the Editor's Workbench

Jesse E. Hartman submitted the photos above, showing Cadet Joseph Elgaway, of Dupont, Pa., and his PT boat model which he built from MECHANIX ILLUSTRATED plans. Cadet Elgaway is a student of Valley Forge Military Academy in Wayne, Pa. The photos bring a $5.00 Workbench first award to Mr. Hartman, and Certificates of Merit to both Cadet Elgaway and Mr. Hartman.

Advisory Board

ELSEWHERE in this issue, you will find an announcement of great importance—the announcement of the new MECHANIX ILLUSTRATED Advisory Inventions Board. The board is made up of a very distinguished group of scientists and inventors: Clyde Pangborn, the famed aviator; Wilbur Shaw, one of the great names among automotive engineers; Dr. Louis D. Clement, noted physicist, chemist and inventor; Sir Hubert Wilkins, scientist and explorer; Dr. James L. Clark, Assistant Curator of the American Museum of Natural History; Captain Bob Bartlett, famous explorer and scientist, and Robert Coles, of the Hayden Planetarium of New York.

These noted men have volunteered to serve on our Advisory Inventions Board in the sincere belief that now—more than any other time in history—is the time for American inventors to exercise their ingenuity to the utmost, both to win the war and to prepare for the peace that is coming.

These gentlemen join in urging all of you to do what you can NOW in the way of producing ideas for America. Your ideas are wanted in Washington—immediately! Get to work on it at once!

Americans have always been noted for their ingenuity. We like to believe that the readership of MECHANIX ILLUSTRATED is made up chiefly of the type of shrewd, smart American that has made America what she is today—and will bring America through to victory and to a new world of peace.

We can't tell you, at this time, all the details of a plan we now have in mind in this connection. We can tell you this much, however: In next month's MECHANIX ILLUSTRATED we are going to make an announcement of *extreme importance* concerning a series of articles which we have been preparing for some time.

In the meantime, we want you to take the appeal of the MECHANIX ILLUSTRATED Advisory Inventions Board to heart. Uncle Sam wants your ideas. Get working on them. *Send them to Washington at once!*

The Airplane of Tomorrow

THERE is no more famous name in Aviation at the present time than that of Major Alexander P. de Seversky. Major de Seversky, as you

know, is the author of the best-selling book recently published by Simon & Schuster, "Victory Through Air Power."

In this book, Major de Seversky outlines his argument that this war can be won through *air power alone*. Reviewers have called his book "The most important book of the war" and critics have said that "Victory Through Air Power" will be as important to military aviation as Admiral Mahan's book on sea power was to the strategy of naval warfare.

As this paragraph is being written, England has started launching its great massed aerial attacks upon industrial Germany. These huge bombing raids are following, in detail, the recommendations laid out by Major de Seversky in his book. It begins to appear that Major de Seversky will become the one great prophet of air power.

Aside from proving himself a prophet, Major de Seversky is a practical engineer and one of the world's most noted designers of aircraft.

With these facts in mind, the Editors of MECHANIX ILLUSTRATED believe they have scored a scoop of the first magnitude in obtaining from Major de Seversky an article titled, "The Airplane of Tomorrow," which is scheduled for pub-

A MOTH ON LAKE ERIE

Harold A. Macaulay, of 126 East Ave., Brantford, Ont., Canada, is the builder of this Moth type sailboat. Both the boat and the sail were made from plans in HOW TO BUILD 20 BOATS, and Mr. Macaulay tells us that the boat handles very well even on the rough waters of Lake Erie. A $3.00 Workbench award goes to Mr. Macaulay, and also a Certificate of Merit.

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Editor's Workbench Chips

lication in our September issue, on the newsstand August 5.

In this article, Major de Seversky will tell you some of the most fascinating facts you have ever heard about the great engineering advances in aviation design and power which have come as a result of the lessons learned thus far in the war. He will tell you, too, how these improvements will be applied to commercial aviation when peace comes.

It's been many months since we've seen an article so vital and so interesting. We think you'll want to make a note of it and reserve your September MI in advance at your local newsstand.

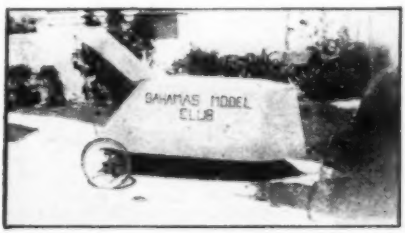
Flying Tanks

STARTING on page 52 of this issue, you'll find the first magazine interview ever granted by J. Walter Christie, the world's most famous designer of fighting tanks. Mr. Christie has been in the inner councils of United Nations armament engineers and certainly is the foremost authority on tanks in the world. This is attested by the fact the Russians ordered 30,000 Christie tanks for their great defense against the Nazi drive.

Mr. Christie now has contributed a weapon to America which he believes, under certain circumstances, could win the war for us in two months time. This weapon is a tank that can be carried behind the enemy lines by a bomber, in much the same manner that an eagle carries a mouse. Although this article has been censored, we feel sure you will get a thrill out of it.

Recently, MECHANIX ILLUSTRATED told you about the design made by Vincent Brunelli for a huge transport plane that could carry two tanks. At the time, a few readers wrote in to tell us that the idea was "utterly fantastic." But we just read a United Press dispatch in our daily newspaper yesterday stating that the Nazis are already actually using air-borne tanks on the Russian battle-front now.

BAHAMAS MODEL CLUB TRAILER



John Cash, Box 136, Nassau, Bahamas, built this model airplane trailer from MECHANIX ILLUSTRATED plans. In November, 1941, Mr. Cash tells us he started the first and only model club in the Bahamas. The club now has 12 active members. In addition to our hearty congratulations for his pioneering work in model activity, Mr. Cash gets a $3.00 Workbench award and a Certificate of Merit.

Editor's Workbench Chips

This, plus the assurance of Mr. Christie that America can do the same thing much better—and will do it—should stop any talk about such ideas being "fantastic."

We must all realize that, as a result of the things being done in this war, there really isn't much of anything that is "fantastic" any more. We're heading into a new and "fantastic" world of mechanics and science. The Editors of MECHANIX ILLUSTRATED are bringing you advance dope on this new world in every issue of this magazine—facts that you won't find anywhere else.

We hope you'll all open your minds to these new and marvelous creations shaping up in the world about us and come along for the ride into the future with MI!

Adventurer

WE'D like to tell you a little more about Captain Charles Borden, author of "The Art of Japanese Warfare," which you will find starting on page 35 of this issue.

We really should have a book to tell you about Captain Borden and to do him justice, but, lacking that, we'll have to be satisfied with a few paragraphs.

Since the salty age of ten years, Borden has had sea water in his veins. He began his career as a wanderer by sailing a raft from Sausolito to San Francisco, using three gunny sacks for a sail. Graduating from grammar school at 12, he signed up as a cabin boy aboard Don Lee's schooner, the *Invader*. He has been adventuring ever since. For years, he sailed the seven seas on all manner of tramps and freighters, touching at nearly every

[*Continued on page* 17]

IF IT COULD ONLY COOK

Orville A. Burkhart, of R. 1, Box 101, Lewisville, Ohio, built this handy portable power unit from a 1¾ horsepower air-cooled motor and a used motorcycle transmission. He has used the unit to operate a 6 volt generator, corn sheller, small grain elevator, cream separator, paint and insecticide spray, power tools, and sheep shearing machine. The motorcycle transmission gives the unit the advantage of variable speeds, clutch, and a foot starter. It certainly seems to be a useful outfit in many phases of farm work, and it brings Mr. Burkhart a $3.00 Workbench award and a Certificate of Merit.

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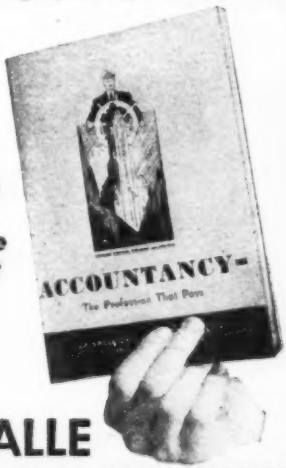

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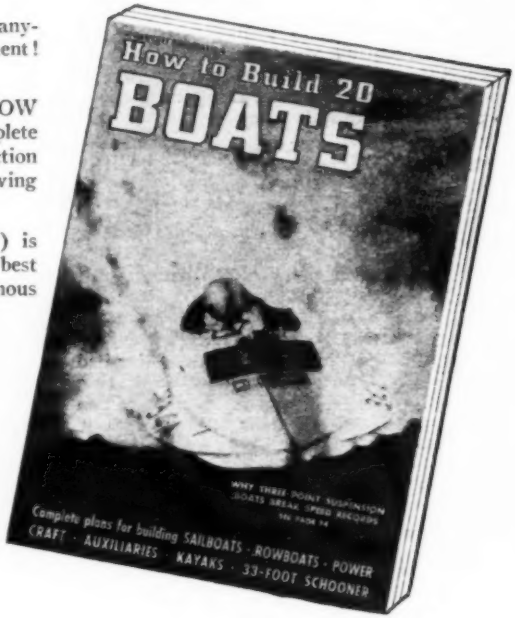

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(CANADIAN ORDERS NOT ACCEPTED)

Editor's Workbench Chips

[*Continued from page 15*]

port in the world from Europe to Port Said and Rangoon.

At the age of 20, he had circled the globe twice. He landed in Shanghai a few days before the Japanese invasion of Chapei and immediately enlisted in Chiang Kai-shek's Forty-ninth Route Army to fight the Nipponese. In the final Jap assault upon Chapei, he was taken prisoner and spent three weeks in a Japanese war prison until U. S. officials obtained his release.

In Hong Kong, he found a Chinese ship builder who agreed to build Borden a teak and camphor wood sloop. In this 17-foot boat, Borden crossed the Pacific—it was the smallest boat ever to cross that vast ocean!

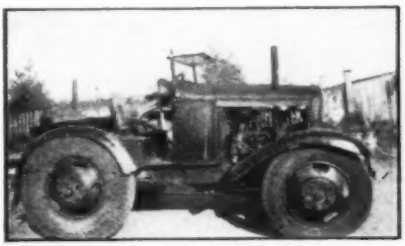
Borden spent ten years roaming the South Seas as a trader. He fell in love with Tahiti and planned to buy a small estate there and live in tropical splendor the rest of his days. He set off for Honolulu to take on a final load of trading goods before realizing his dream of settling down in his Tahitian paradise. He was sailing off the shore of Pearl Harbor, his voyage almost completed, when a flight of airplanes zoomed overhead. A squadron came down and circled his boat, looking him over. Borden looked up, in the early light of dawn, and noticed that the wings of the bombing plane were decorated with bright red disks!

It was the fateful morning of December 7, 1941—and Captain Borden was witnessing the Japanese sneak attack on Pearl Harbor! History will record him as the first American to sight the treacherous Jap assault force!

Unable to return to Tahiti because of the war, Captain Borden came back to his old home in San Francisco. There he is writing some of his adventures for MECHANIX ILLUSTRATED and other magazines.

Next month, he will have another adventure article for you—this time about the glamorous

PLENTY OF SPEED AND POWER



This simple and sturdy farm tractor is the work of Robert W. Fennant, of Munger, Mich. Mr. Fennant tells us that he has been reading MI since 1937, and has saved most of his copies. The tractor has a Model A Ford motor and a Model A Ford truck rear end. The driving arrangement gives it plenty of speed on its way to and from the job and plenty of power for heavy work. Self starter and lights complete the job. A $3.00 Workbench award and a Certificate of Merit go to Mr. Fennant for this snapshot.

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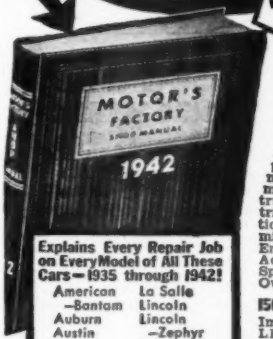

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Editor's Workbench Chips

South Seas and what the war has done to them. We advise you not to miss it!

Model Builders

AS A footnote to an article which we ran in our May issue setting forth the fact that the U. S. Navy wanted young men to build recognition airplane models for use in training aerial gunners, we wish to report that readers of MECHANIX ILLUSTRATED who have written in to us advise us report they have turned out in excess of 1,500 of these models and turned them over to their high school principals!

For those of you who wish more information on the subject of building recognition models for Army or Navy use: Additional information may be obtained by writing the U. S. Office of Education, Washington, D. C.

"Steel-jacketed" Bullets

EVER so often one reads in the newspaper or favorite detective story magazine, some mention of the "steel-jacketed" bullet fired from rifle or pistol. With the nation now (at least to some extent) what may be termed "defense minded" would seem a good time to dispel once and for all this almost universal superstition applied to firearms.

Rifle barrels are made of steel; very fine, special alloy steel, in the larger calibres, and those popularly designated as "high power"—by which term writers usually refer to everything larger than the festive "twenty-twos."

THE SWAMPBOAT

Frank Sokosh, Box 695, New Canaan, Conn., is the builder of this unusual kayak. He calls it the "swampboat," Its swept-up bow permitting it to turn in a very small space. It weighs 24 pounds and can travel through very shallow water. Frank is now building another boat for general all-round use. He gets a $3.00 Workbench award and a Certificate of Merit for this snapshot of his swampboat.

Editor's Workbench Chips

Bullets are made, as a rule, from two- to five-thousandths of an inch larger than the bore diameter of the rifle—in some cases, slightly larger even than the groove diameter—so that when discharged, the outer jacket is forced into the rifling, giving a gas-tight seal and assuring a positive bearing to spin the bullet and keep it "point on."

It should be evident to any thinking person—and particularly so to the man of even modest mechanical attainments—that a jacket of steel would scarcely be applicable to this use; that, were it possible to develop, with safety to the shooter, a breech pressure sufficient to thus force a steel jacket into the rifling of the barrel, the friction and wear would be so terrific that the barrel would be worn out in a few hundred shots. That is exactly what occurred a few years ago when Germany experimented briefly with bullet jackets of a very soft, mild steel—much softer than the rifle barrels.

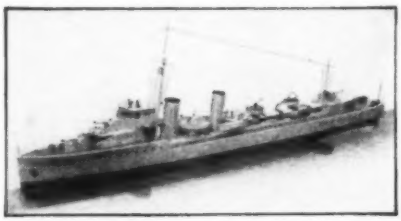
Bullet jackets were formerly made of cupro-nickel, an alloy which had some advantages, but which possessed such an affinity for steel that it made a nuisance of itself by building up flakes and lumps of "metal fouling" in the bore, requiring constant "doping" with chemical solvents to keep the bore clear.

Today's bullets are jacketed principally with pure copper, or with some alloy largely composed of copper, such as "gilding metal," "lubaloy," etc., and are readily recognized by their pure, reddish coppery color.

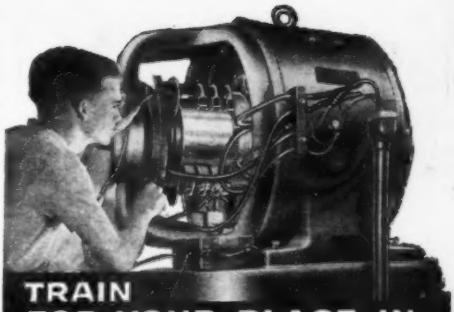
Some companies have adopted the practice of coating their copper bullet jackets with pure tin, useful for its lubricating qualities in the bore, and to reduce wear. Their silvery color, however, is quite distinctive from the "German silver" tint of the old cupro-nickel, and none of them even remotely resembles steel in color.

Jacketed bullets are regarded as necessary in arms developing around 1,800 feet per second velocity and over, as in these higher velocities, even

BUILT FROM A PHOTOGRAPH



Gaspard DeGagne, of 107 Hermaine Street, Quebec, Canada, built this excellent model of the British destroyer "Wallace." The model was made without plans, using only a photograph as a guide. Mr. DeGagne has also made a model of the "U. S. S. Texas" and the destroyer "Preston." At present he is starting to build a model PT torpedo boat from MECHANIX ILLUSTRATED plans. This photograph brings Mr. DeGagne a $3.00 Workbench award and a Certificate of Merit.



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Editor's Workbench Chips

the hardest lead alloys have a tendency to "jump" or "strip" in the rifling . . . hence, the necessity for an outer skin on the bullet which can "take it" at velocities from 2,000 f. s. (the velocity of the old "30-30") through the 2,700 f. s. of our Springfield service bullet, and on up to the 4,200 f. s. of the .220 Swift—the fastest bullet loaded commercially today.

Modern jacketed bullets are not cast, as were the lead bullets of our forefathers. The jackets are die-drawn from copper or some copper alloy, and the core is swedged in from pure lead wire under hydraulic pressure. Thus made, they are remarkably uniform in size and weight, making possible velocities and a degree of accuracy never possible in the "good old days"—old timers' tales to the contrary notwithstanding.

More Bullets

ANENT the above discourse on bullets and also in connection with our mention earlier in this column that there is no "fantastic" thing any more, we wish to make the following report:

Although the subject is shrouded in military secrecy and we can't tell any more than this about it, experts have designed a large calibre bullet to be used against tanks which is about as "fantastic" as they come. This bullet is made in layers, with an outer layer of metal which shatters like glass when it strikes its target and an inner core of soft metal which "squeezes through" armour plate and, once inside a tank, "explodes" into thousands of fragments. They say no tank will be able to stand up against it!

[*Continued on page 22*]

GAS RATION CAN'T SCARE HIM

Luverne Krueger, of Danube, Minn., is the builder of the motor scooter that he's shown riding in the snapshot above. Modified bicycle parts and angle iron were his chief building materials in constructing the ½ h. p. Briggs & Stratton powered scooter. The top speed is 25 miles an hour. Luverne gets a $3.00 Workbench award and a Certificate of Merit for this snapshot.

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Editor's Workbench Chips

[*Continued from page 20*]

More "Fantastic" Stuff

IN OUR June issue, we carried a suggestion by Willy Ley, war weapons expert, for a heavy mine thrower, operating like a giant trench mortar. Last week, the Associated Press carried a dispatch from Moscow stating that such heavy mine throwers had just been put in use by the Nazis! We hope Adolph Hitler hasn't been reading MI again!

If you're interested in new weapons (and who isn't, now!), turn to pages 44 and 45 of this issue for the latest one, and then to page 60 and again to page 68 for more.

Junk the Nazis

METALS-MINDED men like most MI Workshoppers must be will be able to appreciate the menu which one airplane manufacturer has described for employees, to remind them of the importance of saving scrap nowadays.

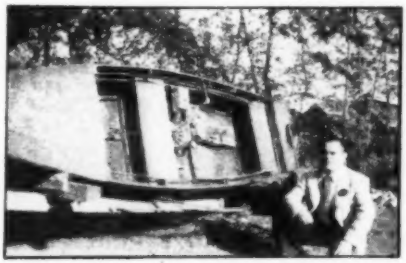
Ingredients: One pair of roller skates, two door hinges, one door knob, one old spade, one trash burner, and one trash basket. Mix 'em together and what have you got? Enough metal to manufacture one 30-calibre machine gun!

The plane-maker's clincher to this pointed recipe is "And some fellows don't care whether aluminum is thrown into a barrel with orange peels!"

Which should urge MI readers, perhaps, to look around their workshops and storage places in garage, attic, and cellar, for idle and discarded metal which can be turned over to the war effort without further delay. Gather it together and, if it weighs enough to justify their making a trip for

[*Continued on page 25*]

ECONOMICAL FISHERMAN



Jimmie Frazier, of Felsenthal's Department Store, Brownsville, Tenn., built this 1-horsepower fishing boat. Its Briggs & Stratton motor gives it a top speed of about 10 miles an hour and a trolling speed of 3. It runs for three hours on a quart of gas, which is economical in any language. Mr. Frazier also developed an extremely clever stuffing box arrangement on the boat's propeller shaft. A Model A Ford water pump forms a major part of the unit, having the packing and packing nut necessary for the purpose. The steering set-up permits steering from any point in the boat, and throttle control from both seats. A $3.00 Workbench award and a Certificate of Merit go to Mr. Frazier for this well worked out boat.

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Editor's Workbench Chips

[*Continued from page 22*]

it, get in touch with the local group assigned to the task of metal-collecting. It'll be another, and appreciated, way of doing your civilian bit—even if it's a junky bit!

Farm Fish Fertilization

FARMERS are being urged to fertilize their farm fish ponds as well as crops, did you know it? It's a new Department of Agriculture idea and not as odd as it looks at first blush. It's not the fish who are to be treated to a potash diet, but the plant life in the ponds. Increased growth of small plants in fertilized ponds provides more and better food for the fish therein.

Re-enter the Guerrillas

EMPHASIS on the mechanized aspects of modern warfare where the great advances and repulses occur has caused some persons to conclude that the day of guerrilla bands of fighters has passed. Not so—guerrillas who are spiritual brothers of colonial Americans who fought in Indian fashion for freedom, today constitute the daring, predatory bands which harass the Japanese in China areas reputedly "conquered." They make up the courageous, doomed army of Chetniks whom Nazi policing has not overcome; are Britain's amazing commandos on the Norway and France coasts; brought sudden death to isolated Japs on Bataan.

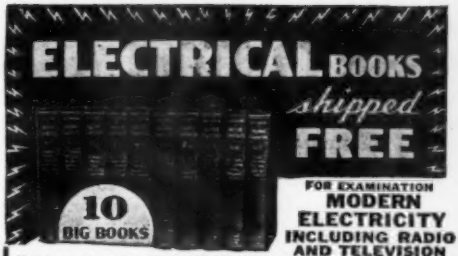
Threats of invasion quickly caused the organization of poorly-drilled but determined and armed units of civilians in Great Britain in 1939-40—and, in recent months, in United States communities on the East and West Coasts.

How such Americans can use firearms most effectively, if the time comes when individual defense and attack becomes as important as it has in other parts of the world, will be told in a down-to-earth, authoritative article by Barry Storm in the September issue. Look for it.

[*Continued on page 31*]

BUILT IN A HOSPITAL BED

John A. Houtzer, of Lima District Hospital, Lima, O., built this beautiful little electric powered model cruiser from an illustration in a story in his Sunday paper. His only workbench was a hospital bed. Our congratulations go to Mr. Houtzer for turning out such an excellent job under such difficult conditions. He also gets a $3.00 Workbench award and a Certificate of Merit.



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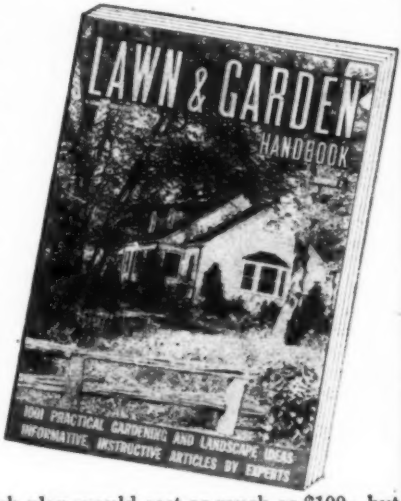

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Magnetic Tape Records Voice, Plays Back

Now being used by radio announcers, actors, and in speech classes as an aid to speech improvement, the Mirrophone (above) records the subject's speech magnetically on a steel tape. Flipping a switch provides immediate play-back, so that the subject may detect and correct errors of pronunciation, emphasis, tone, etc. As it records, the Mirrophone automatically erases — or de-magnetizes — previous recordings. New telephone operators and secretaries in war agencies and industries are being trained with it.

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Editor's Workbench Chips

[*Continued from page 25*]

Seabees

"THIS is a real opportunity for those two-fisted, red-blooded Americans who are not fighting behind a gun to serve shoulder to shoulder with the combatant forces of the Naval service!"

In these ringing words, Rear Admiral Ben Moreell outlined the mission of the *Seabees*, recently organized Construction Regiments of the United States Navy.

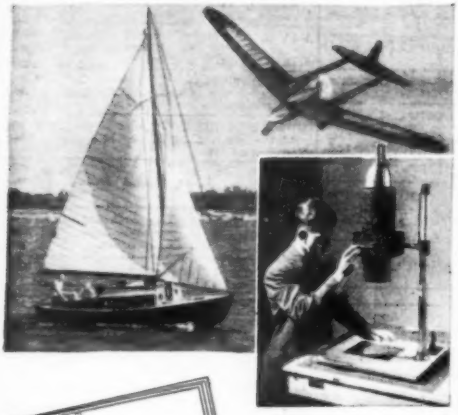
To Admiral Moreell's words we would like to add that this is also the big chance for lots of you MI readers who want to get in the Navy!

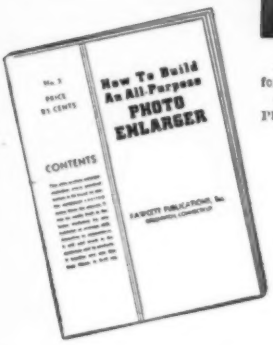
The *Seabees*, for which 18 regiments are being recruited, are divided into Headquarters and Construction Companies comprised of skilled mechanics, carpenters, electricians, blacksmiths, metal workers, drillers, automotive repairmen, welders, painters, draftsmen and other specialists. In short, the *Seabees* are virtually made to order for you MI'ers.

The Construction Companies are organized along military lines, forming regiments of three battalions, each battalion consisting of four Construction Companies of 226 men each and one Headquarters Company of 165 men. The first battalion of the first regiment was organized late in 1941, after Pearl Harbor had made it clear that the service of contractors and their civilian employees would no longer be adequate for construction work outside the continental limits of the U. S. in potential combat zones. This original

[*Continued on page 32*]

Now! ONLY 10¢ FOR "MI" PAMPHLET PLANS





Here's a bang-up bargain for every workshop fan!

The famous MI Pamphlet Plans, which give complete instructions and specifications for building worth-while projects, are now available for **only 10 cents apiece!**

These are exactly the same plans that have sold by the hundreds for 25 cents apiece. With the aid of these Pamphlet Plans (such as the one pictured at left) you can be sure of doing the job right. Take your pick of any or all of the four listed below, and order today by clipping out the coupon:

Dustmaster, All-Purpose Photo Enlarger—**This Pamphlet Plan tells you all you need to know to build an excellent, inexpensive enlarger. It's easy to make and does its job to perfection.**

"Bonnie," 18-foot Auxiliary Sloop—**Here's a boat that any sailing fan will be proud to own. MI Pamphlet Plan tells you how to build it at a fraction of normal cost.**

Gas-Powered Model Pusher Plane—**This model will amaze you with its novel design, high rate of climb and soaring ability. Th Pamphlet Plan gives complete instruction details.**

Full-Sized Training Glider—**An ideal all-purpose ship for the beginner at gliding. It's rugged and easy to build. Any workshop fan of average ability can build it with hand tools.**

FAWCETT PUBLICATIONS, Inc., MI-P-8
Greenwich, Conn.

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☐ Dustmaster Photo Enlarger ☐ "Bonnie," Sloop

☐ Model Pusher Plane ☐ Training Glider

Name _____

Address _____

City _____ State _____
(Canadian Orders Not Accepted)

Editor's Workbench Chips

[*Continued from page* 31]

battalion, in training at Quonset Point, R. I., in January, 1942, became known as the "C.B.'s" (Construction Battalion), the phonetic pronunciation of which gave rise to the finally selected name *Seabees*, and its accompanying insignia, reproduced herewith.

Acting appointments are made to persons with construction experience between the ages of 17 and 50 in various ratings up to and including Chief Petty Officer, depending upon the applicant's age, experience and other qualifications. Enlistment period is for the duration of the war. Salaries range from $36 to $99 per month and include housing, food, clothing, transportation, medical and dental care and other incidentals. An allowance of $34.50 is provided in the case of a dependent for ratings of petty officer, 2nd class, or above.

There it is, and we hope you won't let the seaweed grow under your feet! Apply at your nearest Navy Recruiting Station or write Commdr. E. J. Spaulding, Room 1301, Navy Building, Washington, D. C., for an enlistment application.

Recognition

MANY enthusiastic model builders have put their "all" into the construction of the scale model airplanes requested by the Navy for aircraft recognition training, only to find that their efforts did not quite meet with Navy Department "tolerances." This does not mean that the models are not, on the whole good, but merely that the Navy can't use them because they're deficient in some minor detail, or perhaps a tiny bit out of scale.

If you are one of these patriotic but disappointed modelers, you can stop drowning your sorrow in drink—the Army wants your models! Yes, boys, the U. S. Army Air Corps will be glad to take your models if the Navy doesn't want 'em. They are also carrying out recognition training, and because it's easier to pick out a plane from the ground than from the heaving deck of a warship the models can be slightly less accurate than for the Navy and still serve the purpose. So send your models to the Army Air Corps Flight Command, or to Science Service, Washington, D. C. You won't get any reward except the pleasure of knowing that you're helping Uncle Sam win the war, and that the Army is giving you recognition for your model.

One lighting company tests 20,000 lamps a year by having them bumped, pounded, dropped, beaten and burned out to exaggerate treatment in service.

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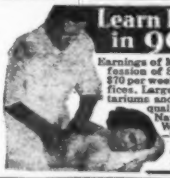

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RAY F. KUNS, Dept. A-44, Madisonville, Cincinnati, Ohio

Says Everybody is HYPNOTIZED

A strange method of mind and body control, that leads to immense powers never before experienced, is announced by Edwin J. Dingle, well-known explorer and geographer. It is said to bring about almost unbelievable improvement in power of mind. Many report relief of long standing illness. Others acquire superb bodily strength and vitality, secure better positions, turn failure into success. Often with surprising speed, talents, ability and a more magnetic personality are developed.

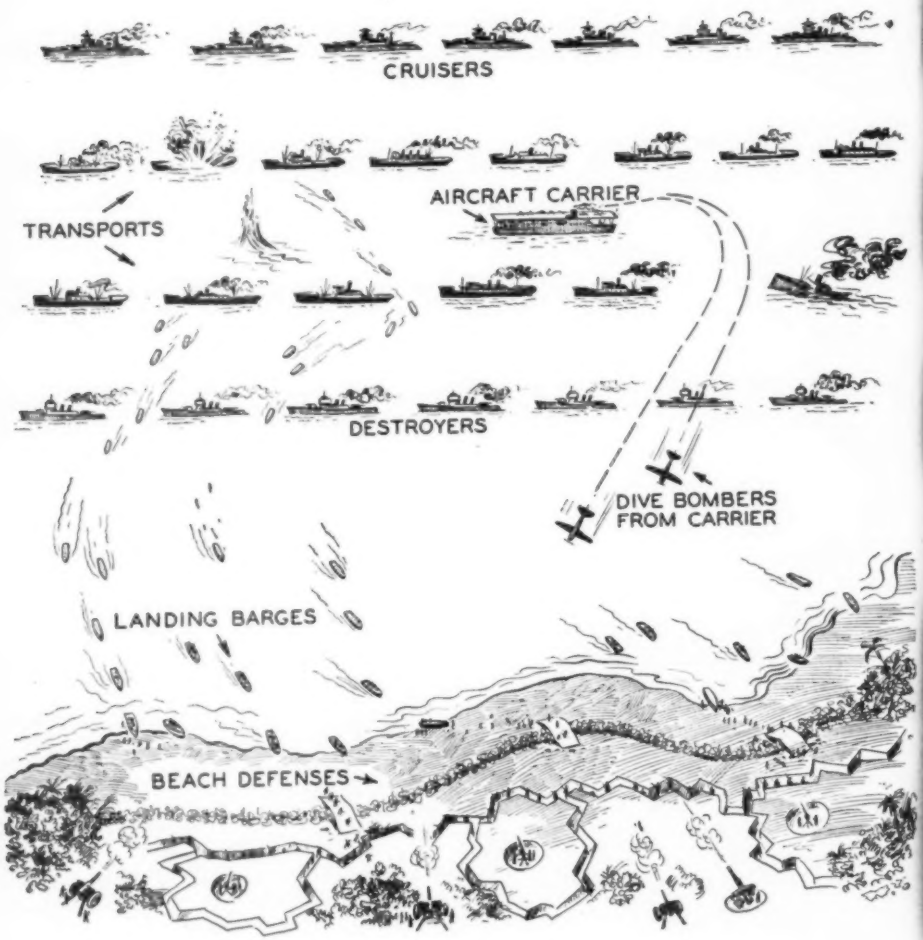
The method was found in remote and mysterious Tibet, formerly a forbidden country, rarely visited by outsiders, and often called the land of miracles in the astounding books written about it. Here, behind the highest mountains in the world, Mr. Dingle learned the extraordinary system he is now disclosing to the Western world.

He maintains that all of us are giants in strength and mind-power, capable of surprising feats, from the delay of old age to the prolonging of youth, from conquest of sickness to the achievement of dazzling business and professional success. From childhood, however, we are hypnotized, our powers put to sleep by the suggestions of associates, by what we read, and by various experiences. To realize their really marvelous powers, men and women must escape from this hypnotism. The method found by Mr. Dingle in Tibet is said to be remarkably instrumental in freeing the mind of the hypnotizing ideas that paralyze the giant powers within us.

A nine-thousand word treatise, revealing the startling results of this system, is now being offered free to anyone who quickly sends his name and address. Write promptly to the address below, as only a limited number of the free treatises have been printed.

The Institute of Mentalphysics, Dept. A 73, 213 South Hobart Boulevard, Los Angeles, California

Plan of Japanese Landing Assault



ALONG a five-mile front (the sketch concentrates an operation covering 50 sq. mi.) Japanese armed and armored barges driven by plane propellers run into the defenders' center and flanks at dawn. Life-jacketed Japs swim in from any barges sunk. Carrier-based planes dive-bomb defending artillery. The Japs cross barbed-wire by throwing mats across it, then assail machine-gun positions. Others set up trench mortars on the flanks, lob shells among defenders. By noon the operation is over.

The Art Of Japanese Warfare

How do the little brown men do it? Here, a soldier who fought them tells you the secret of Jap success.

Eye-Witness Story!

by Captain Charles Borden

Formerly of Chiang Kai-shek's 49th Route Army

I FOUGHT with Generalissimo Chiang Kai-shek's Forty-ninth Route Army against the Japanese invaders of Chapei. I had occasion then and many times since to observe at first hand the highly successful methods of Japan's invasion "commandos."

Forever known as clever filchers of Western ideas, the yellow soldiers of Japan were certainly the last source in the world from whom anyone ever expected an original contribution to the art of war.

The following, though tough on wishful thinking, are the hard, cold facts I observed during Japanese coastal invasions and they more than any other one thing form the predominant topic of discussion today among military officers recently returning from the far Eastern and Southwestern battlefronts.

ABOUT THE AUTHOR

Capt. Charles A. Borden is one of the greatest adventurers alive today. He was *the first man* to see the Jap attack on Pearl Harbor. He was in his sailboat 20 miles off Honolulu on the fateful morning of December 7, 1941, and spied the Jap planes swooping in for their treacherous attack. At right, he is shown with a Jap airplane machine gun shot down at Pearl Harbor, a gun which the Army permitted him to return to the mainland.

Captain Borden has crossed both the Atlantic and the Pacific in a 17-foot boat. For 15 years he has sailed the South Seas as a trader and a soldier of fortune. He will bring MECHANIX ILLUSTRATED another adventure story in our next issue.

Saki, potent rice wine, is heated before drinking.

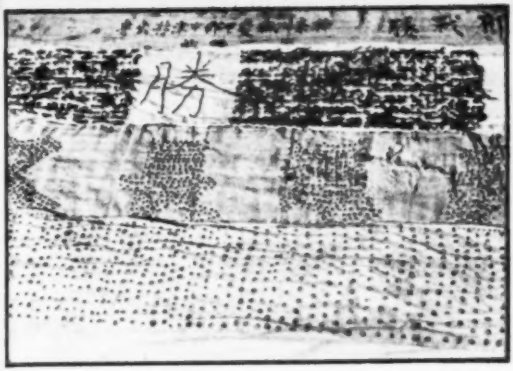
Frankly, the Japanese have added to the technique of modern warfare a method of amphibian attack that has amazed the military world and negated all the previously accepted tenets.

In addition, they have trained their individual soldier in such a manner and fitted him out with such unusual equipment and arms that he has become virtually independent of "soup kitchens," ammunition trains and most of the other impedimenta cluttering up the supply trains of white armies.

Each Jap carries his own food and prepares it himself in the field, eliminating field kitchen trucks.

Man for man, as our Army and Navy recently stated, the Jap is no match for the soldier of Democracy. But for the purpose for which he was trained—namely, the Jap thrust into the South Seas—no better soldier existed.

And the United Nations' military leaders have learned a number of new techniques from the Jap which I propose to explain here. It's



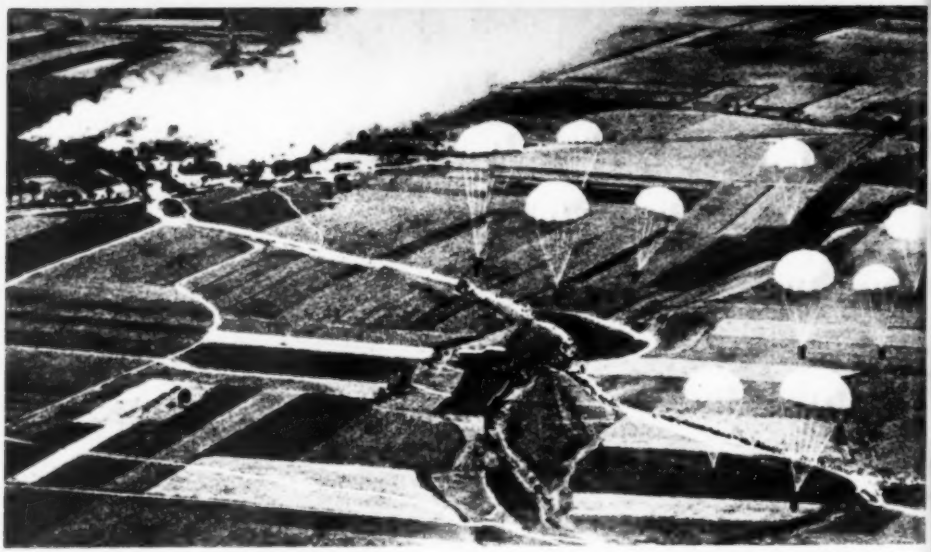
Superstitious and blinded by "Emperor worship," all Jap soldiers wear a "belt of a thousand stitches," shown *above*, as a good luck charm, and carry a miniature Japanese flag, shown on aviator, *right*.

Poor Mr. Moto! Secret of his mobility is largely due to the fact he must tote practically all of his own supplies.

the first time, so far as I know, that they have ever been explained in an American magazine.

In order to understand their successes, let me first tell you something about the Japanese soldiers.

They are an army of tough, leathery veterans, blood hardened by ten years of China warfare and well trained in all the tricks of cunning vital to survival and victory. They pride themselves on hand to hand bayonet fighting, and time and again I



This remarkable photo shows a Jap mechanized attack. Note tank column in the right foreground, under parachutists.

have seen them charge against great odds with great courage and an innate ferocity and fearlessness. Cruel and ruthless and certain that their enemies are the enemies of all mankind, they are convinced that rape, pillage and ruthless slaughter are the most natural things in the world. Their official history is a yellow and crimson tale of horror. I have seen many of its pages being written.

Cunning enough to kill his enemy by trickery first, the Japanese is a long suffering soldier of uncomplaining disposition. In place of fear of death he has a heightened sense of patriotic fervor and loyalty to the Mikado—a fatalism best illustrated by the typical farewell greetings that are exchanged between two Japanese soldiers departing for the battlefront. They say to each other, "Sayonara, (farewell) until we meet again at Yasukuni." All men who die in uniform have their names enshrined at the huge Yasukuni Shrine in Tokio. Yasukuni is the Japanese Valhalla. Glory in war is Japan's slogan, the glory of each enemy death spells another "Banzai for the Emperor God" and to the human huntsman goes Tokio's highest laurels if he is daring, spectacular and successful.

A flying ace is considered among the general populace to be the greatest of public heroes and Japanese youths take to flying as ducks to water, are normally sound of eye and heart and as aviators possess good judgment and a thorough knowledge of their engines. During two years of compulsory training each has had 730 days of Emperor worship and has become thoroughly imbued with a fanatical faith in Japan's destiny.

Though stocky and tough the average Japanese soldier is a grotesque little bow-legged fellow with broad hips and a peculiar intoed shuffling gait. However, a much larger number of him and his companions can be fitted into small quarters than United Nations soldiers. Averaging less than five feet three inches tall and weighing less than one hundred and thirty-eight pounds, he squeezes easily and ideally into transport ships, tanks, pill boxes and airplanes.

In the Southwestern Pacific the Nipponese "Japandos" (Japanese version of commandos) have consistently landed and made good their landings at places utterly devoid of docks or other normal debarkation assets.

On open beaches and barren shores their technique is to land under the protection of naval guns and airplanes. The key to their success in coordinating a sudden surprise landing with speedy spectacular advances to vital penetration points is contrary to all the accepted rules of the mechanized military world. They employ almost no heavy land fighting equipment but stress largely lightness to achieve their flash advances and execute sudden surprise maneuvers. Particularly effective in this [*Continued on page* 156]

By Air To Alaska

Smooth, fog-free airfields like the one above were hewn from the forests and bogs of northwestern Canada by tractors which labored inland *(right)* to the newly-important sites.

by Mandus E. Bridston

The information contained in this article has been approved for publication by the U. S. Office of Censorship.

A CHAIN of five new air fields, hewn from the Canadian wilderness far enough inland so that they are always free of nature's chief menace to pilots, fog, ties Alaska lightly yet more securely than ever to its markets, sources, and defenses in the United States proper.

Huge transport planes winged safely over the new skyway last winter, little more than a year after the U. S.-Canada joint defense board implemented their recommendation of the airports with assignment of engineers and construction gangs to plan and level landing fields on given areas of forest, bog, and barrens. Come peace, they'll be stops on a great commercial air route to the Orient for, built on the great circle of the earth, they bring Chicago 2,000 miles closer to Shanghai, for example, than by the southern pathway across the Pacific. The "Northwest Passage" long sought by explorers of old is now a reality! Right now [*Continued on page* 154]

Are You A

by Louis Hochman

ARE you afraid of the dark, of cats, crowds, or fire, of thunder or lightning, of blood, pain, or death? Do you tremble in terror on high places, or in closed places, or open spaces? Is there any particular object, situation, or type of location that you find terrifying to endure? If the answer is yes, then, brother, you've got a phobia!

Phobias are unreasoning, uncontrollable fears, generally confined to some specific object or situation. Although the afflicted person often realizes how silly and ridiculous his fears are, he still finds it practically impossible to do anything about them, so powerful is

Here are photographic impressions of an unusual phobia and a common phobia. Fear of eyes *(at left)* is unusual; fear of thunder *(below)* is common.

A "Freudy-Cat?"

the psychological grip they have on him.

Dr. Sigmund Freud, the famous psycho-analyst, spent a great deal of time analyzing these secret fears. Punsters say, therefore, that the victims of phobias are "a-Freud" to live, or that they are "Freudy-cats."

These intense fears have numerous origins. In most cases, they are cultivated during childhood when parents unwittingly frighten their children with some form of punishment inflicted psychologically on them. For instance, it is quite

Fear of animals *(above)* is called "Zoophobia." Fear of blood is called "Hematophobia." It is also a common fear.

"Monophobia" is the unreasoning fear of being left alone. It is illustrated here.

common for a parent to punish a child for misbehavior by locking him in a dark closet. The child, if sensitively impressed, may develop a dreaded fear of this form of punishment, and grow up having a fear of either darkness, closed places, or both. In later years, he may even forget how the fear originated, but the phobia will still haunt him.

Undoubtedly, many phobias are silly and it is difficult to imagine any sane, grown-up individual being seriously troubled by them; yet, there are case histories of just such situations, which are as weird as the fears themselves. One of the most unbelievable of such cases is the following:

A fifty-year-old professor of psychology was not afraid of high places through his youth, but soon after college saw a servant fall four stories from his room. He helped bring in the injured man, and went for a doctor, but the incident developed in him a fear of high places. He could no longer sleep in high rooms at a hotel. Troubled by this newly acquired phobia, he tried in vain to ascend Bunker Hill Monument as a form of self-discipline, but found the tension too great when only half way up. He was only able to cross the suspension bridge at Niagara, 18 years later, by walking in the middle and grasping firmly to a carriage. His fear, as he analyzed it, was rather more that the whole structure may collapse, but partly that he would lose control.

Many victims of Acrophobia fear high places because of some unreasonable impulse they have to throw themselves off! Such is the case of a 15-year-old boy, who, happening to glance over a high banister, sprang back

One of the best known of the thousands of phobias which beset humans is "Claustrophobia"—fear of being inside a closed room.

Many people living in big cities are victims of the fear of open spaces, "Agoraphobia," illustrated in the photo above.

across the hall with a shiver. Then, too, there is the case of the 11-year-old boy, who when on high places, always wanted to try to fly off!

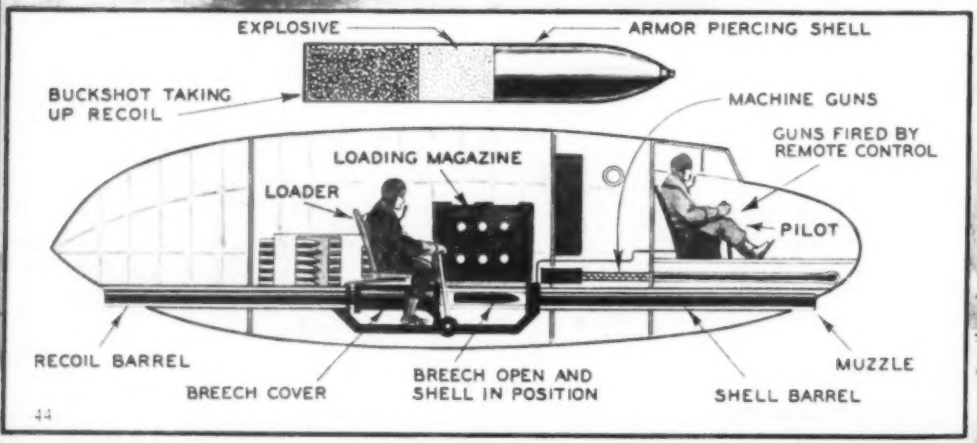
Many phobias are merely the outgrowths of overactive imaginations. Children that have been frightened with threats of punishment by supernatural monsters, ghosts, etc., often picture these things so vividly in their imaginations that it preys upon them nightly. The parent who discovers the child has some particular fear and uses that fear as a whip to keep the child under control is unwittingly making matters worse by encouraging a phobia that may haunt the child throughout his life.

Still other parents unconsciously stir up the imaginations of their children in the most innocent manner. For instance, take the case of the girl whose mother unknowingly sowed in her the seeds of Thanatophobia when she used to sing, "When this poor lingering, faltering [*Continued on page* 160]

There are hundreds of phobias and each one has a fancy scientific name. Here is a partial list of them. Can you find your own pet fears here?

ACROPHOBIA: Fear of high places
AGORAPHOBIA: Fear of open spaces
ANTHROPOPHOBIA: Fear of men or some particular man
ASTRAPHOBIA: Fear of thunder or other meteorological phenomena
AICHMOPHOBIA: Fear of sharp and pointed objects
BOTOPHOBIA: Fear of cellars
BATOPHOBIA: Fear of falling objects
CLAUSTROPHOBIA: Fear of closed places
CLIMACOPHOBIA: Fear of falling downstairs
DORAPHOBIA: Fear of fur
DROMOPHOBIA: Fear of crossing the street
EREUTOPHOBIA (ERYTHROPHOBIA): Fear of blushing
GYNOPHOBIA: Fear of women or some particular woman
HEMATOPHOBIA: Fear of blood
HYPNOPHOBIA: Fear of sleep
HYDROPHOBIA: Fear of water
KLEPTOPHOBIA: Fear of stealing
MISOPHOBIA: Fear of contamination
MONOPHOBIA: Fear of solitude
MECHANOPHOBIA: Fear of machinery
NEOPHOBIA: Fear of the new or unfamiliar
NYCTOPHOBIA: Fear of darkness
NECROPHOBIA: Fear of the dead
OCHLOPHOBIA: Fear of crowds
ODONTOPHOBIA: Fear of teeth
OMMAPHOBIA: Fear of eyes
PATHOPHOBIA: Fear of diseases or one particular disease
PECCATIPHOBIA: Fear of sinning
PYROPHOBIA: Fear of fire
PHAGOPHOBIA: Fear of swallowing
POTAMOPHOBIA: Fear of running water
TAPHEPHOBIA: Fear of being buried alive
THANATOPHOBIA: Fear of death
THEOPHOBIA: Fear of God
TOXOPHOBIA: Fear of poison or of being poisoned
TOPOPHOBIA: Fear of situations—stage fright
VOKEPHOBIA: Fear of returning home
YLOPHOBIA: Fear of the forest
ZOOPHOBIA: Fear of animals or one particular animal

MECHANIX ILLUSTRATED drawing
by Reynold C. Anderson



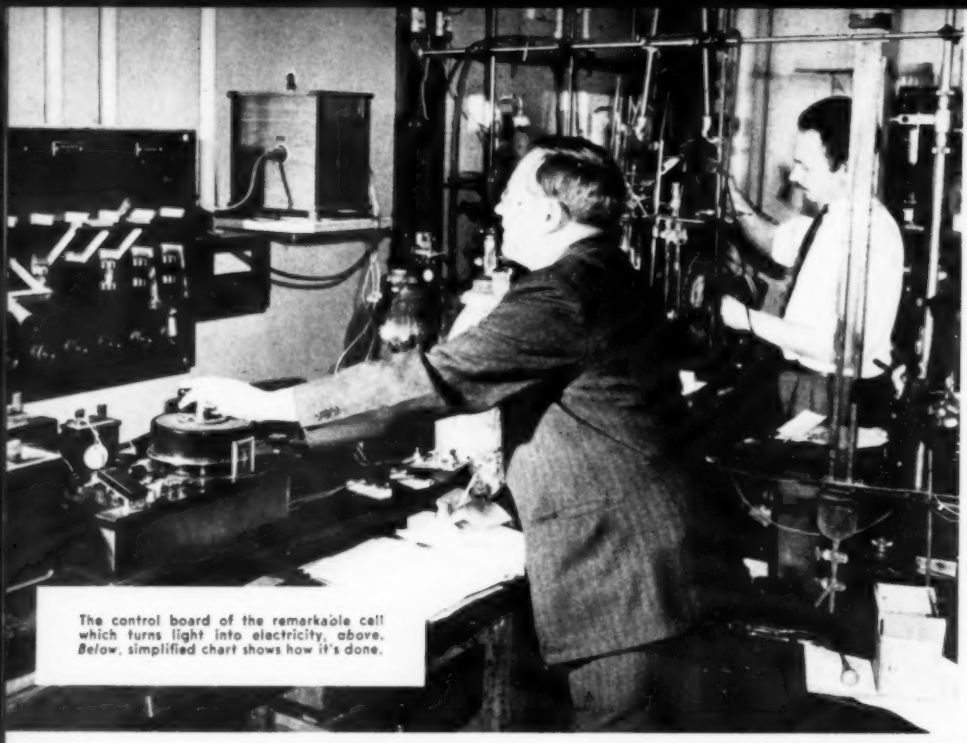
A Big Gun For Planes

MECHANIX ILLUSTRATED presents herewith what it believes might be a valuable and practical suggestion for a method of mounting a deadly big gun in a plane.

At present, the armament of planes is limited to 20 mm. and an occasional 37 mm. cannon, because cannons of larger calibre have too great a recoil for a plane.

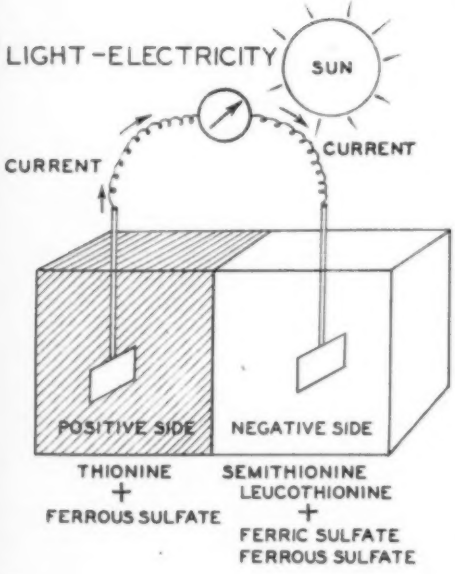
In World War I a large number of three-inch (approximately 75 mm.) guns known as Davis non-recoil guns were manufactured in America. The Davis gun was specifically designed for use on aircraft, but was finally ruled out because the then-exposed position of gunmountings on planes made it difficult to operate. But a modernized version such as MECHANIX ILLUSTRATED offers here might very well have great possibilities today.

Principle of the gun is essentially simple: a common breech is situated between two barrels, one rifled for the shell, the rear one designed for a simultaneous discharge of buckshot that will cancel out the recoil from the forward explosion. The buckshot offers more frictional resistance than the solid shell passing up the rifled barrel, forces the shell outwards, and itself disperses within a few yards beyond the rear end of the gun.



The control board of the remarkable cell which turns light into electricity, above. Below, simplified chart shows how it's done.

NOW—POWER



For the first time, Man has turned sunshine directly into electricity! Here are the facts.

by Myron Weiss

A BRIGHT ray of sunshine cut through the gloom of a laboratory at the Massachusetts Institute of Technology, at Cambridge. The ray fell upon a lens and the lens focused the sunshine upon a peculiar-looking cell filled with a purple solution. Wires ran from the cell to a galvanometer. A stout, moon-faced scientist stood anxiously over the equipment, his forehead creased as he watched the galvanometer intently. Then, as the sun grew momentarily brighter, the needle of the galvanometer moved.

Man for the first time had turned sunshine into electricity!

Though the amount of electric current thus produced was small, the implications were immense. The moon-faced scientist, Eugene Rabinowitch of M.I.T., had made a start

toward a goal for which scientists have striven for decades: The utilization of solar energy.

The sun pours 200 *trillion* horsepower of energy upon the earth each day. All the hydro-electric plants in the United States and its outlying possessions develop a total of only 20 million horsepower. Thus the sun gives us for nothing each day 10 million times as much energy as our man-made hydro-electric stations can produce.

Imagine what wealth we would have if we could use that power directly!

All the energy in our world comes primarily from the sun. Most of the troubles of mankind result from man's struggle to use this energy. Wars are fought chiefly for this energy. Daily toil is necessary chiefly because this energy is so hard to get.

All of our modern mechanized civilization is based upon the use of waterpower, coal and oil for power. What are waterpower, coal and oil? *They are all stored-up solar energy.*

When our ancestors put a paddle wheel in a brook they put nature directly to work for them. The turbine generator of a hydro-electric plant is nothing more than a paddle wheel pushed around by water falling from a height.

Water gets to those heights because sun heat evaporates water of oceans, lakes and rivers. The vapor rises and forms clouds. Clouds cool. The vapor condenses to water again. It is too heavy to float in the air. It falls, and we call it rain.

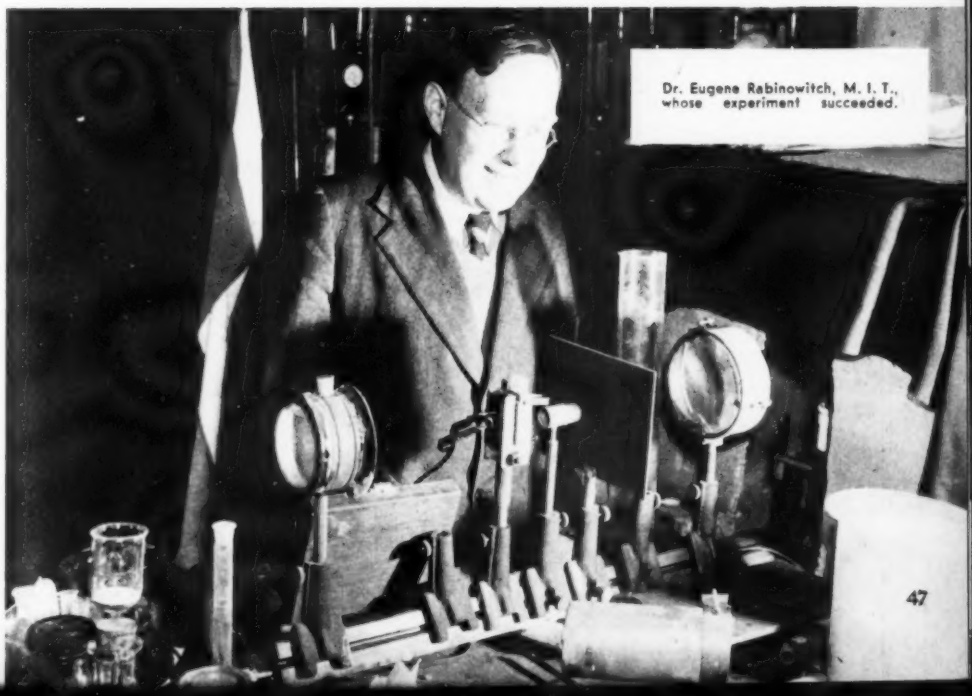
Coal is both ancient sun heat and sun light stored up in ferns, trees and other vegetation ages ago. In the same way ancient plants and animals (which lived off plants) died and turned into petroleum. We now burn coal and oil to generate electricity, which we use to run machines and light up our buildings.

The trouble is that these methods of producing power are highly inefficient. They are "second-hand" methods.

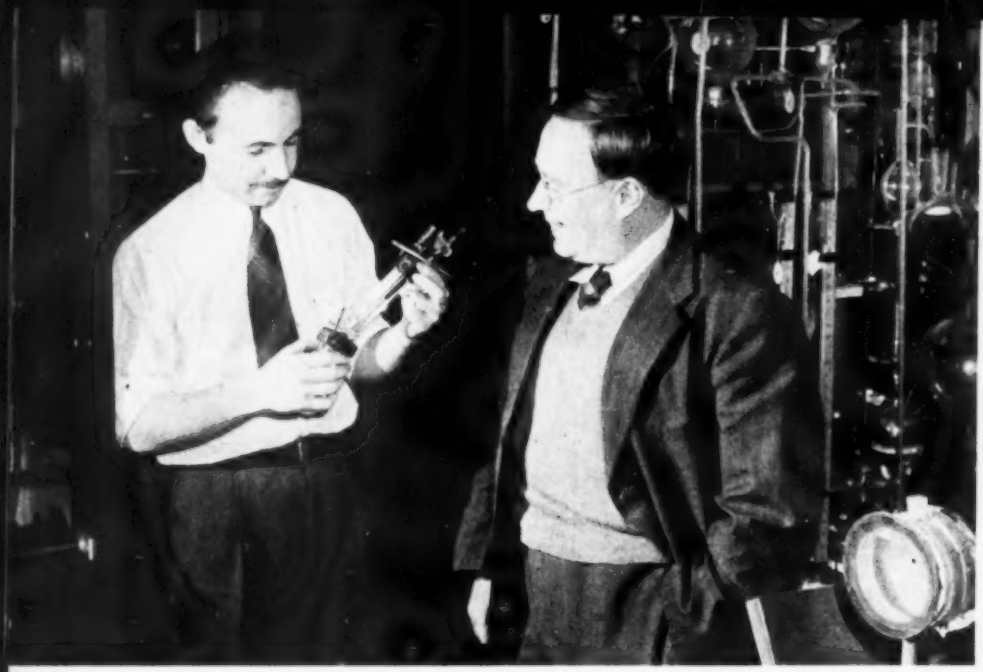
To use this solar energy directly—instead of its accumulated forms of falling water, coal and oil—has become the goal of clever modern scientists.

Charles Greeley Abbot, the longtime secretary of the Smithsonian Institution in Washington, started his studies of solar radiation fifty years ago when he was a student at Massachusetts Institute of Technology. When he was graduated he at once joined the Smithsonian Institution's Astrophysical Laboratory, of which he has been director now

FROM SUNSHINE!



Dr. Eugene Rabinowitch, M. I. T., whose experiment succeeded.



Dr. Rabinowitch and his assistant, Elias Burnstein, are seen above preparing one of their cells in the M. I. T. laboratory.

for 35 years. Dr. Abbot thus has become the world's greatest authority on the way in which the sun sends its energy to earth, and the way in which the energy reaches the surface of the earth. He is also the world's foremost authority on converting heat from the sun into steam which can run generators of electricity. A battery of mirrors concentrates sunlight, which contains sun heat, on to steam boilers.

Dr. Abbot's system is clumsy and not very efficient. On the other hand sun heat is so plentiful and costs nothing. Therefore solar heat engines may be profitable in some very sunny regions of earth.

Meanwhile solar heaters, developed from Dr. Abbot's far-reaching researches, lie on the roofs of Florida and California homes and heat up water for dish washing, bathing and laundry, and save the householders the cost of wood, coal or oil.

Dr. Rabinowitch, the newest expert in this field of trapping cost-free sun energy, utilizes *sun light* instead of *sun heat* to produce his electricity.

Before we describe the Rabinowitch system, we ought to give a salute to Dr. Godfrey Lowell Cabot of Boston, a scientist who became a manufacturer and a millionaire, and remained a scientist. Dr. Cabot's wealth comes from the manufacture of carbon black, which he started to make far back in 1887. He is also one of the first men in the world to fly. Incidentally he invented devices to enable planes in full flight to pick up objects on the ground. As a result there is a successful pick-up service of air mail and air express now serving small communities.

Learned and rich, Dr. Cabot created the Solar Research Fund with $615,000 at the disposal of invesigators. Dr. Rabinowitch is working with Cabot money.

LIGHT represents energy in action. When a current of electricity—which is also energy in action—goes through a piece of tungsten wire in your electric light bulb, the electric energy disturbs the atoms of tungsten in the wire. The electric energy shoves around and displaces electrons within the tungsten atoms. Every time a tungsten electron gets butted out of place the tungsten atom loses a piece of its energy. It shows that loss by a flick of light. These flicks are so many and come so fast when your light bulb is turned on that you have a steady gleam of light.

The reverse of this process occurs in plants. Here carbon dioxide gas is everywhere in the air. So is water vapor. When vapor and

gas meet in the green surface of leaves, during daylight, they absorb the solar energy and thus are able to combine and recombine until they form complex substances, like glucose.

This is photosynthesis which scientists are just beginning to understand, scientists like Dr. Rabinowitch and General Motors' Charles Kettering.

To imitate the photosynthesis of living plants Dr. Rabinowitch searched his laboratory for substances which behaved like chlorophyl in the presence of sunlight. Two such substances are methylene blue and purple thionine.

If into a solution of either of these bluish dyes you dissolve bluish-green crystals of ferrous sulfate—$FeSO_4$—and then expose the mixture to sunlight (or to artificial light for that matter), the solution becomes almost colorless. The thionine, say, changes to two related substances—semithionine and lencothionine; and the ferrous sulfate turns to ferric sulfate—$Fe_2(SO_4)^3$. The reaction is reversible. Upon removal of the source of light the bleached solution resumes its original substance and purplish tint.

The photo-chemical reaction is quite complicated. But in simple words what happens is this: When the dyes are exposed to sunlight their molecules fall apart into separate ions. When you put them in the dark, the ions rearrange themselves again.

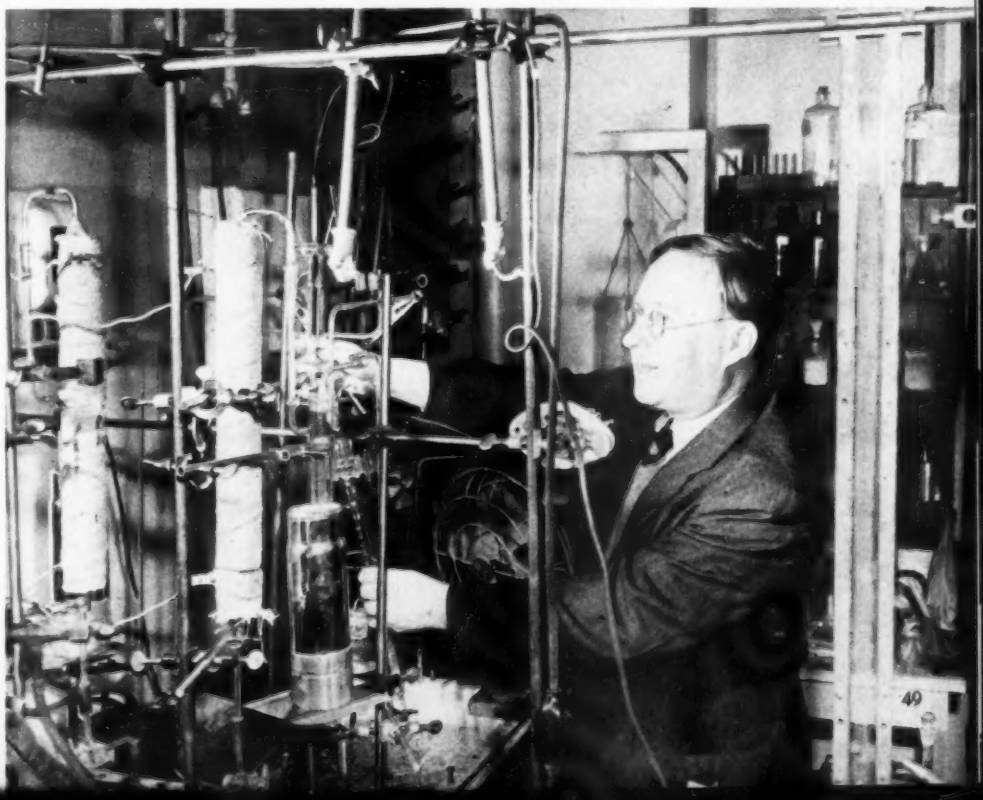
Ingeniously, Dr. Rabinowitch rigged up a cell containing thionine and ferrous sulfate. By suitable arrangement he keeps part of the cell dark and part illuminated. The lit-up bleached part becomes electrically negative, the dark purple part electrically positive. By suitable arrangement the purple can circulate to within range of the light and become bleached, while the bleached substance circulates out of the lights influence and becomes purple again.

In these transformations, electrons flow. Where you have a flowing of electrons, there you have a current of electricity.

Dr. Rabinowitch taps this photo chemical current by inserting a platinum electrode in each half of the cell. The output of the present Rabinowitch cell is a faint fraction of an ampere. Says Dr. Rabinowitch: "Quantitatively the result at present is not significant. But qualitatively it is important."

Qualitatively this accomplishment is tremendously important. It not only shows how to turn light energy [*Continued on page* 153]

Part of the complicated apparatus which Dr. Rabinowitch uses in his experiment with artificial light and sunlight, *below*.



Keep The Old Bus Rolling!

With the war on, MECHANIX ILLUSTRATED realizes that you automobile owners will want all information available which will enable you to stretch out the life of your car. We present herewith a list of basic rules for this purpose. And, beginning in this issue (you'll find it on page 159) we are starting a brand new feature, YOUR WAR-TIME CAR, which will answer each month all your questions about automobile problems during war.

Here are some simple rules to prolong the life of your automobile.

by

Frederick C. Russell

Spare That Clash

Good shifting is largely dependent on how well the transmission synchronizers are working. Best way to service them is to keep them running in the right kind of lubricant. A mid-summer gear lube change will pay dividends.

Stretch Its Life

You can get much more life from the fan and generator belts by seeing that they are properly lined up. If out of line a correction can be made by moving the generator or by shimming the fan pulley.

Contact Counts

Latest discovery by motor experts is that rough breaker points may be more efficient than smooth ones because of greater area of contact. Line them up properly and give them the right cam angle (the period the points remain closed). If you first set the points correctly you can get three times the usual service from them.

Stop and Go

Never stop at the top of a hill to let the engine cool. Its temperature will drop more quickly if you go on down the other side. For any stop in very hot weather allow the engine to idle a minute before switching it off, and have the throttle closed. If you stop to let the tires cool off allow the car to roll to an easy stop rather than risk heating up the tires more by applying the brakes.

Slows Output

Many motorists who are careful to keep the battery posts clean forget to keep them tight. Unless connections are clean and tight you can't get maximum output from the generator. Sulphated posts are easily cleaned with ammonia and kept clean with a little heavy oil.

Watch Your Reasoning

It's risky to assume that if you warp the brake drums through careless stopping you can enjoy complete relief through having them trued. They will be thinner through metal being cut away, and that makes them more liable to warpage. Incidentally, if the clutch grabs because of dampness affecting its lining the brakes also are apt to grab.

Why That Wear?

A bent steering arm that causes one front wheel to toe out excessively when turning a corner will cause one front tire to wear twice as fast as the other. This, oddly enough, can occur regardless of the fact that both front wheels may be accurately adjusted for the straight-away.

Out of Round

Have you found an out-of-round piston among those checked during an engine overhaul? Of course it would be better to have any such piston serviced by the special resizing processes now available, but an old idea will do in a pinch. Just tap the piston lightly on the side showing the greatest diameter of the skirt. Use a rawhide mallet.

Saves Slippage

Just because you remember to keep your foot off the clutch pedal is no reason to assume you are not "riding the clutch." The pedal must be adjusted to give about an inch free travel before the plates start to disengage. Too little free travel is just like riding the pedal continuously.

Spare the Lining

Don't let the grease in those front wheel bearings get thinned out to a point where brake lining may be damaged. If the grease around the lead cap of a wheel is fresh and clean the indications are that the bearings are all right and that the brake lining is in no immediate danger. When taking out wheel bearings always place them on a clean cloth after washing in gasoline or kerosene. They can easily pick up dirt if put on the garage floor.

Put some vegetable base oil on the beads and some graphite on the rims to prevent injury while removing tires *(top)*. Measure springs to make sure they aren't sagging.

Must Match

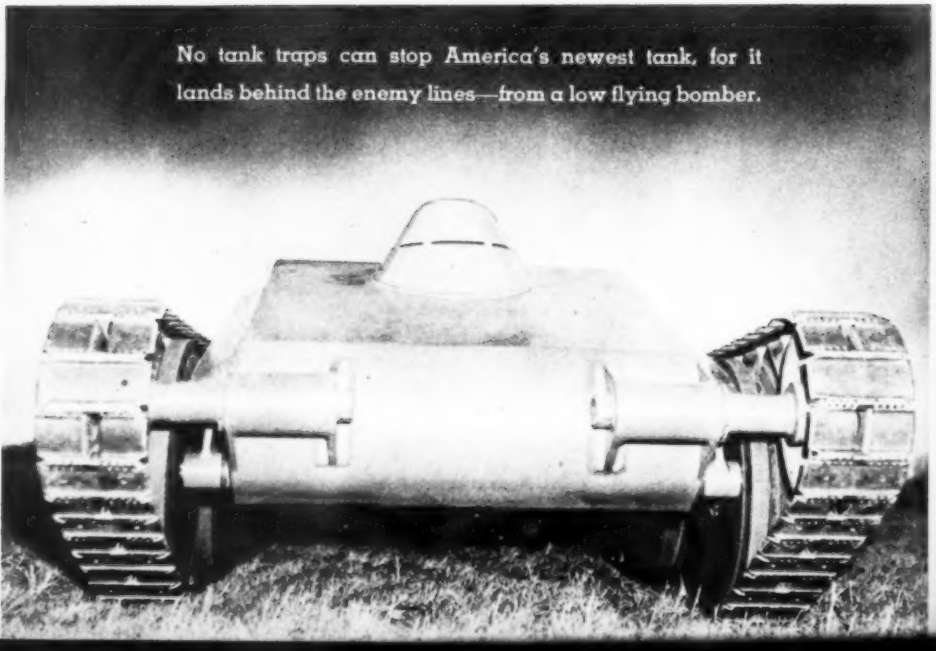
A cylinder head gasket that isn't quite right for your engine is likely to cause overheating. Holes for the water passages must match those in the block exactly. Water circulation is partially controlled by the size of those openings, small ones acting as restrictions to accelerate the rate of water flow.

[*Continued on page* 153]

THE deadliest war weapon yet devised in this mechanized war has just left the drafting rooms of the world's greatest high speed tank designer. At this very moment that weapon is taking shape in steel and dural in a war plant in eastern United States. The weapon is the fastest tank ever built, and its designer is the famous John Walter Christie—the engineer whose lightning-fast juggernauts hit two miles a minute ten years ago! That was the "Christie Chassis M," and it left the experts wide-eyed and open-mouthed when that speed was clocked. But right now, as you read this line, 30,000 Christie tanks have won glory blasting the Nazis in Russia. Thousands more, on battlefields throughout the world, fight for England and America.

So intense was the secrecy surrounding the design of this amazing tank that not even the most superficial part of the plan was created in the plant where the machine was to be built. Every single line and detail was worked out in specially equipped drafting rooms at Christie's country home in New Jersey. He not only has drafting rooms in his home where he works day and night, but he also has a laboratory drafting room that is open to no one but to himself and his engineer, Leonard Anderson. In addition to the drafting room Anderson's laboratory is the home of the secret model work that is being done now. It is in this laboratory that all the new design work will be carried out until manufacturing begins on

THIS WEAPON COULD



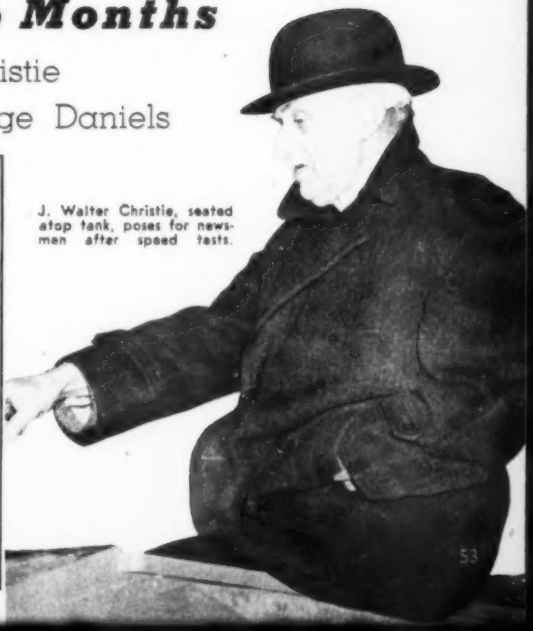
END THE WAR

In Two Months

Says J. Walter Christie

In an Interview by George Daniels

Early in the war several British tanks of Christie design were trapped in a narrow ravine by a Nazi anti-tank gunner. Unable to maneuver in the narrow space, the leading tanks were hit, the others fled. J. Walter Christie did not forget that incident. He designed the airplane tank which arrives at its objective through the air—where there are no traps. It is the fastest tank in the world. Among Christie's other designs are the 155 mm convertible gun mounts of 1917, Army Mack Truck caterpillar treads, 75 mile-an-hour tank destroyer with 75 mm cannon, many types of Russian and British tanks, and other armored vehicles with speeds up to 120 miles per hour. Mr. Christie began his automotive career as an apprentice machinist, became a racing driver, pioneered front-drive, and became the world's leading designer of high speed military vehicles. Now his airplane tank makes history.



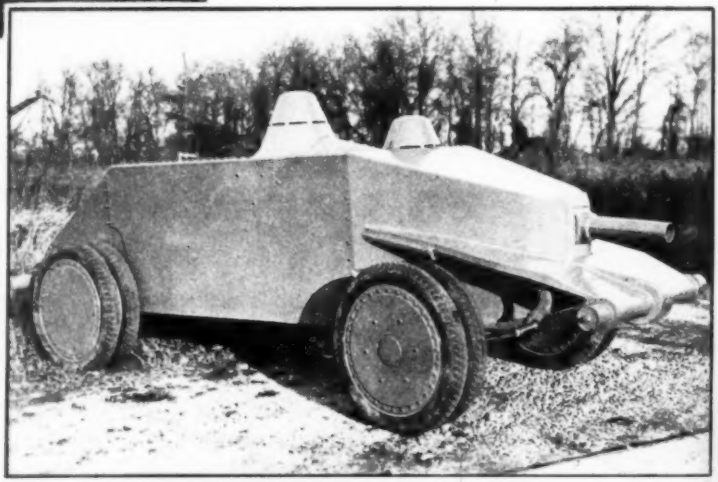
J. Walter Christie, seated atop tank, poses for newsmen after speed tests.

a large scale. That will be in a few weeks from this writing.

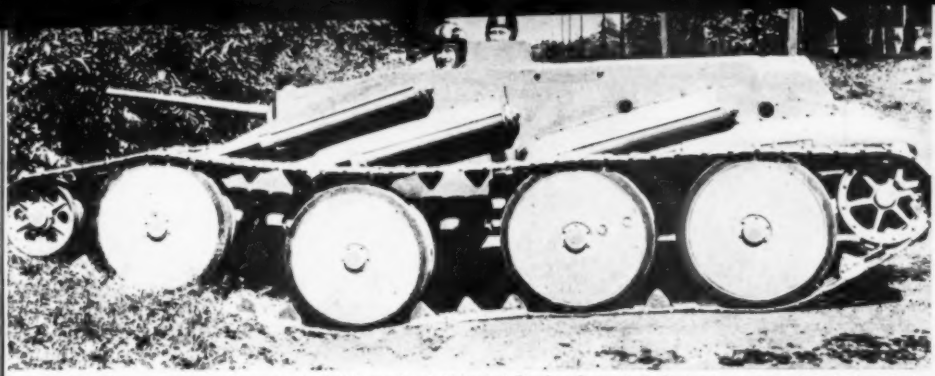
It was at his home that the designer, himself, received me and told me all that can be told about America's new wonder weapon. Spread out before us was a blueprint showing the general outlines of the "airplane tank"—for this mighty fighting machine is specially designed to arrive by air at the scene of battle. Unbelievable as it may seem to the layman, this is no fantastic dream. I asked Mr. Christie when actual construction work would begin, and to my amazement he said, "We have already started production—"

He went on to tell me that he sincerely believed that 10,000 of these machines could win the war for the United Nations within two months. And that, too, is no idle guess, for the military value of the airplane tank is reflected not only in the United States, but also in the Russian plans for large scale production of them. The actual figures, of course, cannot be revealed.

"This bombing plane alone can never win the war," Christie told me. "It can blast civilians and kill women and children," he continued, "but



Christie tank above thunders up an embankment at high speed. The one at the right is the forerunner of airplane tanks, did 100 m.p.h. *Below:* Designer Christie clocks his 1937 model as it hits speed of 67 m.p.h.



This 1938 Christie model turned in a speed of 64.3 m.p.h. at Aldershot Proving Grounds in England. It preceded airplane tank.

that won't win a victory—you've got to meet the enemy armies face to face." The past few years of war certainly bear out his opinion.

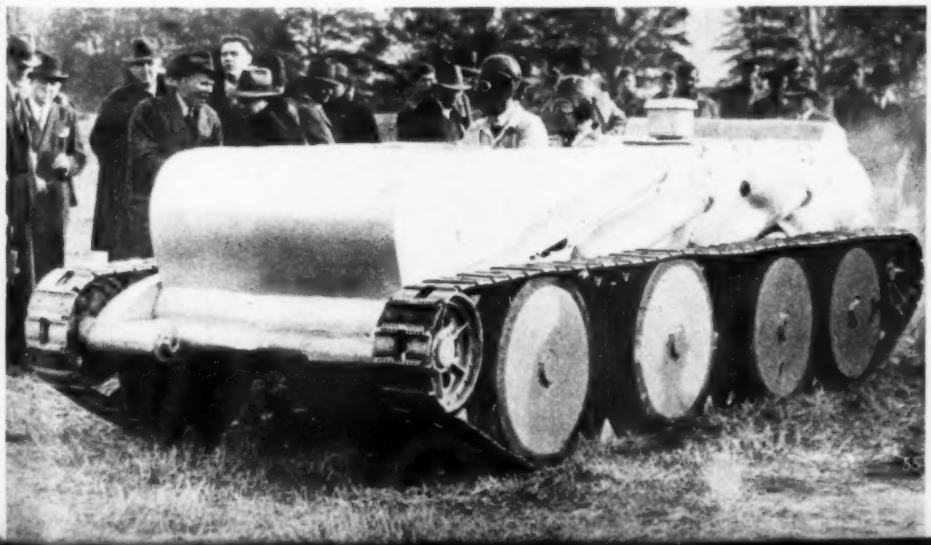
Weighing five and a half tons—very little for a tank—the new Christie machine can be carried by any large capacity bomber or transport plane. Only about four and a half feet in height, it is so streamlined that it can be slung below the belly of the ship without appreciable drag. An even more important benefit of its low silhouette is the fact that such proportions make it an extremely difficult target.

I was anxious to see what the airplane tank would look like suspended beneath a giant war plane, so with Mr. Christie's permission one of his assistants handed me a photograph showing one suspended below a Boeing B-17 Flying Fortress. Even though vital details that could not be disclosed had been carefully removed from the picture, it was enough to startle all but the most phlegmatic observer.

The designer told me how the machine might be put to use—flown into enemy territory and deposited in vast numbers at the area of the objective itself. Released at 90 miles an hour, the flying tanks could demolish factories, warehouses, railway junctions, and practically everything else of military value. The planes could later pick the tanks up again. Once the enemy's production facilities are smashed their military power is broken. No other tank ever built can come anywhere near matching this one for speed and ability to negotiate rough terrain.

Even the Germans have copied what they could of Christie's ideas, and they've tried in vain to get hold of more. Heigl's "Handbook of Tanks," published in Munich, had this to say even before this war broke, "The name Christie has become a proverb, and signifies operative mobility—if tank troops are to be movable over the largest areas with rapidity, then there remains only the solution offered by Christie." But Christie was not offering

Tank destroyer below is modification of Christie tank design. It carried 75 mm. cannon at 75 m.p.h. Shock absorbers are on side.



Some of the 30,000 Christie tanks in Russia. Tanks like these have enabled the Russians to stop the Nazis in their tracks.

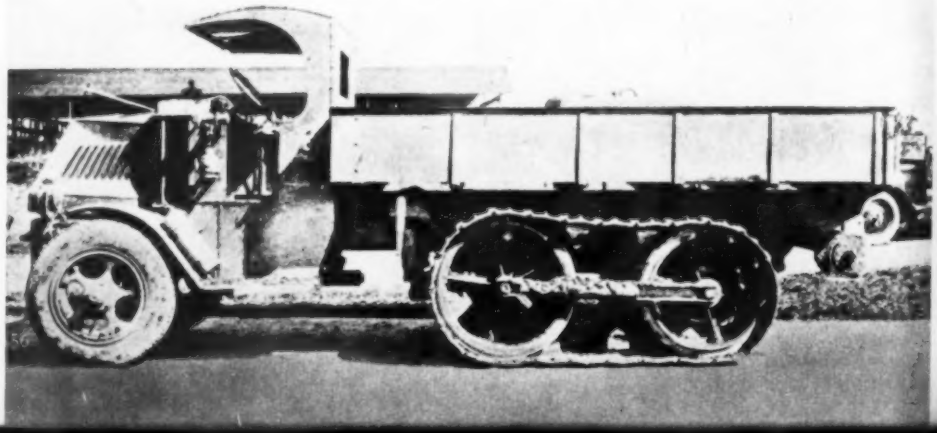
his solution to the Nazis. He was and is offering it to the Americans.

"Our aim," Mr. Christie told me, "is to make the fighting equipment of the United States—both for defense and offense, so strong that no war can ever again be even temporarily successful against us."

There can be little question that he will accomplish that aim. No other military tank in the world could long survive the battering of landing from an airplane at 90 miles an hour. But the airplane tank by virtue of secret features, obscured even on distant photos of it, can do it. It has already proven its unsurpassed ability to take obstacles at terrific speed that would smash an ordinary tank.

While the armament of this tank cannot be revealed, even the casual observer can

Christie caterpillar tracks enable this Mack Truck to haul its cargo through areas otherwise impasseble, without bogging down.



This 155 mm gun mount is a Christie chassis. This photo was made during firing tests at Aberdeen Proving Grounds.

see that it could equal the best of them in that respect. As one of the earliest pioneers of portable mounts for heavy guns, John Walter Christie knows the tricks of heavy artillery mounting better than any man alive. He wouldn't tell you that, though. Like many of the world's outstanding men of accomplishment, he might almost be called shy. But all you have to do is look at a few photographs of the giant caterpillar gun mounts that he has turned out during the past twenty-five years—huge steel monsters carrying 155 mm guns—or perhaps his wheel-caterpillar system that enables the Army's Mack trucks to go almost anywhere.

Years ago he startled military circles with the marine tank, a military tank that could travel through muddy shell-torn battlefields or turbulent rivers with the same powerful ease and dispatch. Today, the airplane tank has mastered the air. No tank traps can stop it as it streaks through the skies toward the vital points of the enemy. And the enemy can never know in advance where it will strike, for it is as mobile as the bomber that carries it.

Years of designing and testing have preceded the final development of this weapon, for no tank had ever before possessed the necessary combination of lightness and toughness which is vital to this type of operation. Remarkable as it seems, no super ship is needed to fly the airplane tank. Another device, long in preparation in the Christie designing rooms, enables everyday American bombers and transports to do the job.

The device that works this seeming wonder is a specially built power-driven landing gear. By means of caterpillar treads like those of the tank itself, it secures traction unattainable with wheels, and literally catapults the plane into the air in 150 yards. The plane's engines drive both the propellers and the caterpillar treads as the ship takes off with its tank cargo. In the air the mechanism retracts in the same manner as a conventional landing gear, and when extended again for landing, can easily absorb a shock that would demolish other types. [*Continued on page* 153]

ENEMY

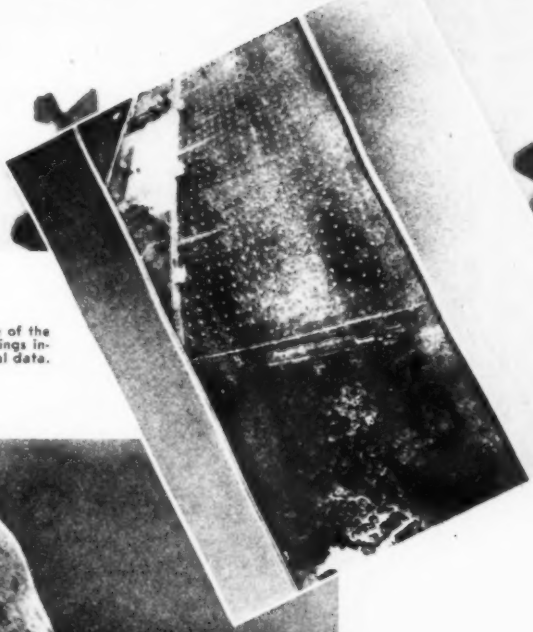
(Left) The Russians have captured many Germans in eastern Europe—among them spies like this pigeon carrying an automatic camera directed earthward!

German shepherd dogs are worked in co-operation with the pigeons. As shown here, a single dog can easily carry two baskets, each containing a bird, to their starting point. The dogs were used in case roads were not passable for the Krupp trucks like the one of which the hood is shown in the photograph above.

Y SPIES!

Germans in his pigeon earthward!

(Right) Here's a section of film taken by one of the birds as it flew to its cote. The German markings indicate position of enemy troops and other vital data.



As soon as aloft, the tiny camera, equipped with an automatic release, begins taking photos at five-minute intervals of the ground over which the bird flies. The Nazis thus obtained valuable information without risking a single reconnaissance plane, and with the certainty that at least two or three pigeons would return with the desired data.

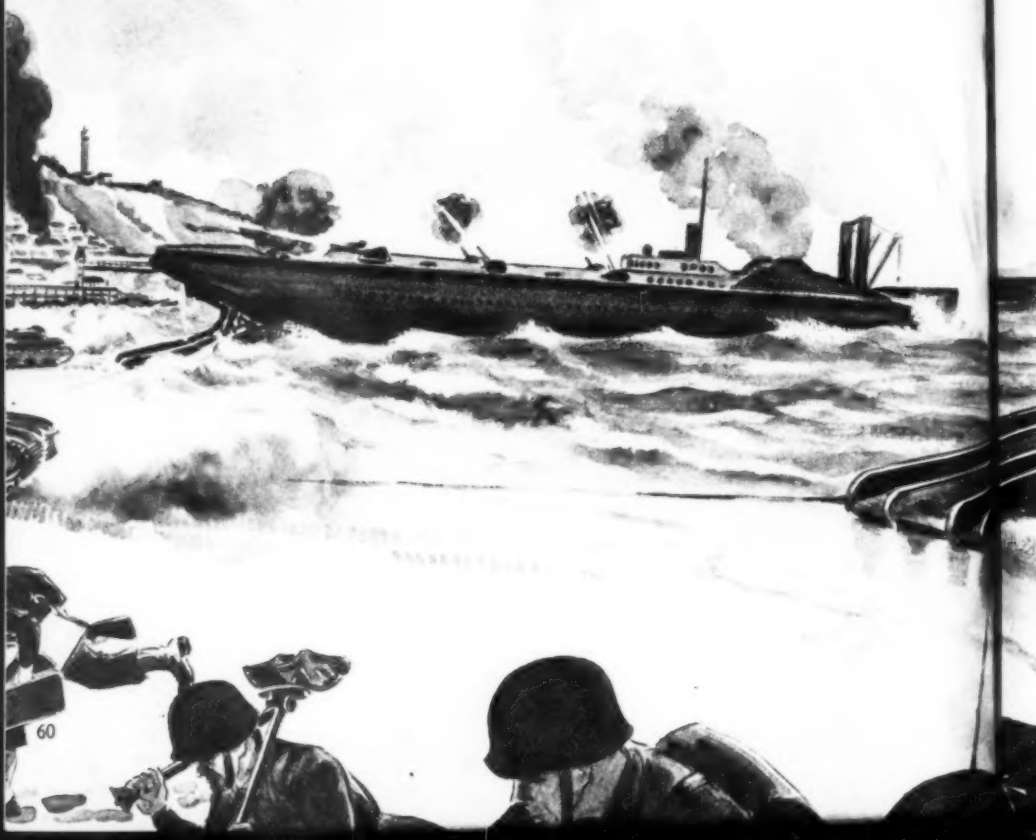
TRANSOCEAN PANZER

by Jacques Martial and Robert C. Scull
Industrial Designers

IN THE foggy summer dawn of the North Sea, a fleet of 100 armored ferries slips up to the coast of Denmark. Four miles off shore, the invasion fleet is spotted for the first time by Nazi defenses. Guns from Nazi *flak* ships and shore artillery open up with a roar. An answering roar from the armored ferries returns the fire.

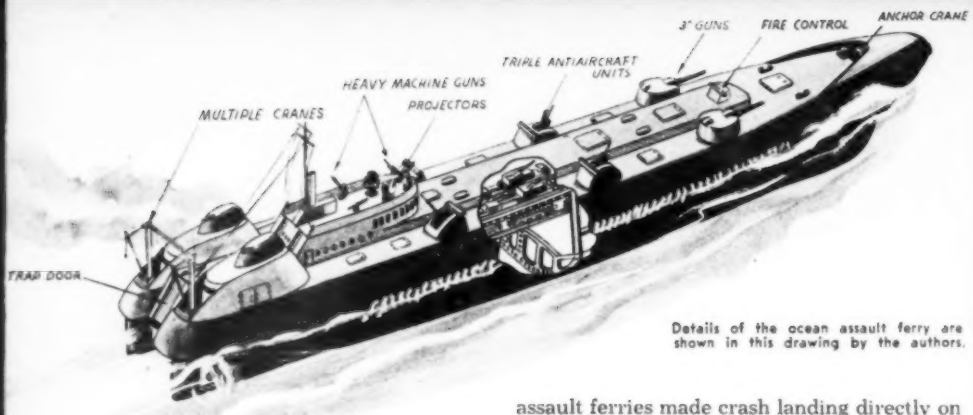
The assault ferries, which had been riding low in the water, now approached the shoal waters off the shore. Suddenly pumps aboard them began throbbing and streams of water poured out of the sides of the ferries as they quickly emptied ballast tanks. The ferries rose from the water, like submarines surfacing, and lightened of their ballast, streaked for the beach. With their ballast tanks emptied, they now drew less than six feet of water.

Skimming across the surface of the sea, their guns blazing, the



ER UNITS

Martial & Scull, well-known industrial designers, present a new assault ferry designed for an invasion of Germany.



Details of the ocean assault ferry are shown in this drawing by the authors.

assault ferries made crash landing directly on the beach. Instantly, huge trap doors in their bows opened out and down and streams of tanks, motorized marines, gun carriers and other equipment vomited out onto the shore, using the trapdoors as landing gangplanks.

Multiple anti-aircraft guns atop the ferries spit a hail of lead upward to ward off Nazi dive bombers. In a few moments, troops had established a beach head.

* * *

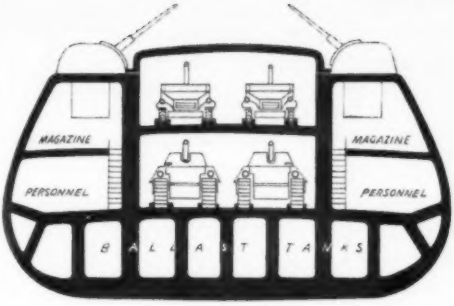
Jacques Martial

Robert C. Scull

ABOUT THE AUTHORS

Jacques Martial and Robert C. Scull are the principals of the New York industrial designing firm of Martial & Scull who have become famed for the functional and modern streamlining of a number of industrial products. If you have an electric clock, the chances are it is of Martial & Scull design, for they designed such clocks for General Electric and Telechron. They have designed other things ranging in size from streamlined pen and pencil sets (for the Esterbrook Pen Co.) to observation cars for crack trans-continental streamlined trains.

Mr. Martial is a native of France, having spent five years in the French Army in World War I. He came to America shortly after the first war. Mr. Scull is a former college instructor of industrial design, schooled in engineering and advertising. In recent months, they have devoted much of their time to the design of new types of weapons and ships.



The assault ferry's ballast tanks are shown in cross-section.

Such might well be a description of the invasion of Nazi Europe by United Nations forces if an assault ferry such as we have designed especially for MECHANIX ILLUSTRATED were adopted by the Army and Navy.

At the time this was written, no successful invasion of Nazi Europe had occurred, other than British Commando raids upon the coast. One reason no such invasion had been made was the fact that, up until this time, no nation had as yet perfected a technique of landing heavy armored forces necessary for blitz warfare in the face of well equipped shore defenses.

True, the Japanese had demonstrated a highly successful technique for landing light forces upon hostile coasts—but all of their initial successes were made against coasts which were lightly defended. (For a diagram of the Japanese basic plan for shore assaults, see page 34.) It is very doubtful that the Japanese attack could succeed against a properly defended coast line. And, too, the Japanese have not yet devised a method of landing anything but very light equipment. Certainly, the Japanese methods could not be turned successfully against the powerful Nazis unless the German strongholds had first been much more seriously weakened than they are at the present writing.

The easiest way to invade Europe is by means of some new weapon which will land medium or heavy tanks, a full complement of motorized equipment and a fully equipped force of soldiers on those shores. We sincerely believe we have created a special-type ocean ferry which will perform this feat.

The accompanying illustrations show the principal features of the assault ferry which we have designed. Its chief feature—and its most radical point—is the use of ballast tanks very similar to those used by a submarine for submerging. Since this boat is essentially a ferry—much like river and bay ferries used in civilian life—we have added the ballast tanks to give it the necessary stability for an ocean crossing.

The tonnage of this ship could vary and should be determined after its load capacity is decided. However, it should be capable of crossing any ocean at a cruising speed of at least 16 knots when fully loaded, and 20 knots or more when ballast tanks are emptied preparatory to the beaching operation. It should be able to carry directly to the point of attack a self operating unit of a minimum of 8 medium tanks, 4 halftrack trucks mounting 75 mm. guns, 4 self [*Continued on page* 152]

Announcing

The MECHANIX ILLUSTRATED ADVISORY INVENTIONS BOARD

WILBUR SHAW—Noted automotive engineer and inventor.

CLYDE PANGBORN—Aviation pioneer.

DR. LOUIS D. CLEMENT—Physicist, chemist and inventor.

SIR HUBERT WILKINS—Scientist and explorer.

DR. JAMES L. CLARK—Explorer and Ass't. Curator of American Museum of Natural History.

CAPTAIN BOB BARTLETT—Explorer.

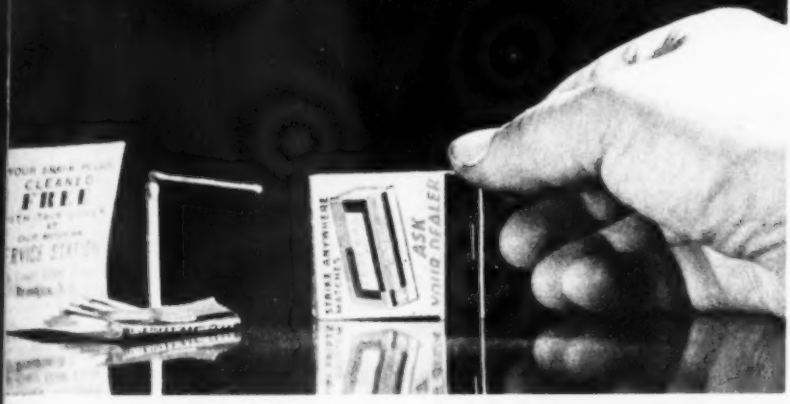
ROBERT COLES—Noted astronomer and Ass't. Curator of the Hayden Planetarium.

The distinguished men listed above have consented to serve as an Advisory Inventions Board for MECHANIX ILLUSTRATED for the duration of the war and during the making of the peace. They join in urging all readers of this magazine to exert their ingenuity to the utmost at the present time to produce ideas which will help America gain victory. Such new ideas as the one presented in the accompanying article are needed NOW.

Among the readers of MECHANIX ILLUSTRATED there may be one man who is capable of producing one idea, one invention which will be a decisive factor in winning the war. This Board of famous scientists urges you to use your ingenuity toward this end *immediately*. Send your inventions and ideas to Washington! At once!

CAN YOU DO IT?

by Roy Lester



Know how to make a safety match defy gravity like this? Simple—fold a match perpendicular, support the base of the defier with a match book. Light the heads with a third, then almost at once blow out the flame. Remove the support and the match will remain horizontal, the charred heads clinging.

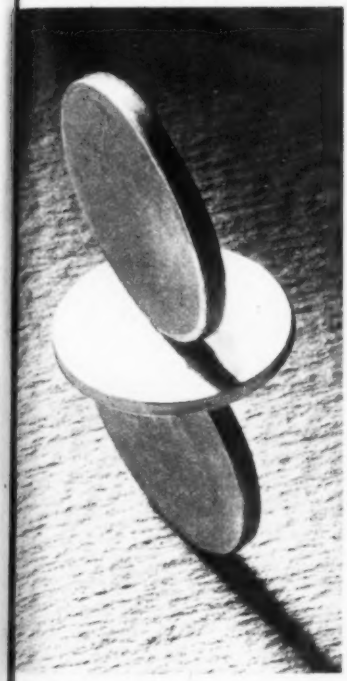
Drop a lighted match in a tumbler, cover tightly with your palm. Flame, exhausting oxygen, goes out and the vacuum created draws in skin. Glass hangs to the hand securely.

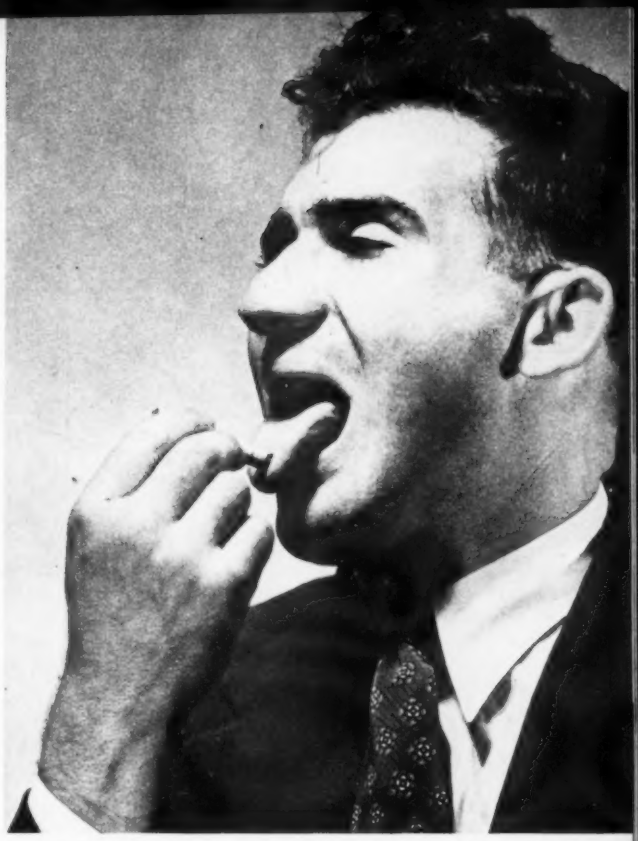
Coin dance. Place wet coin on bottle's mouth, grasp bottle. Hands' heat expands air in bottle, causing the coin to lift.

Lay ruler over table edge, cover with newspaper, strike it. It'll break because air pressure on paper holds ruler end.

Baffling but easy tricks for bar and parlor fun—and profit!

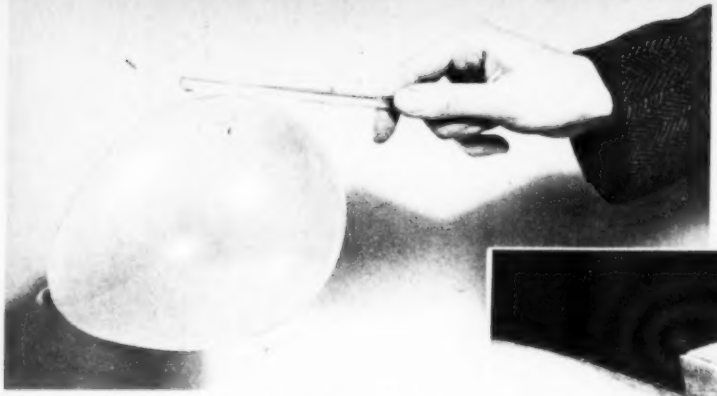
Below: Hands steady? Try balancing a nickel on edge, then put a dime across it, and another nickel. (Slugs are shown, due to laws regarding representation of money.)





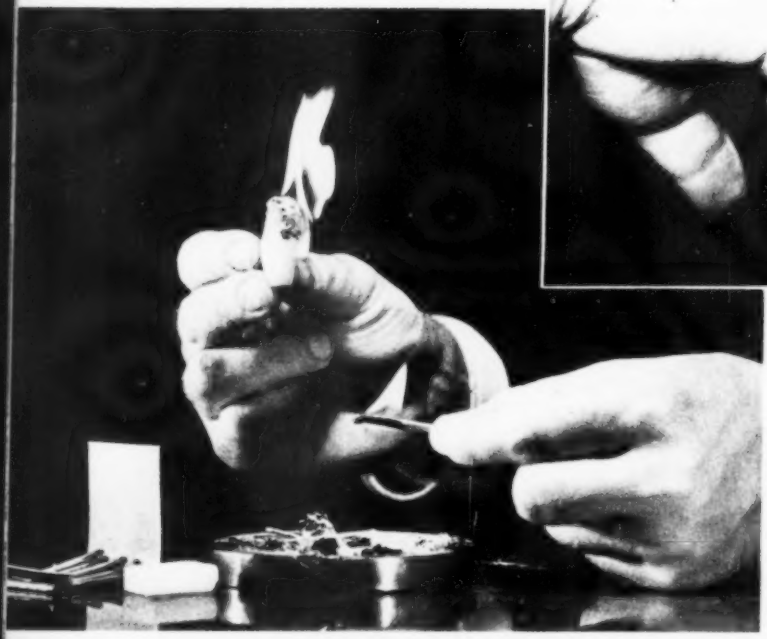
Ouch, butting a cig that way hurts! Not if you know the trick of coating the tongue thoroughly with saliva first. Dampen out the cigaret glow gradually.

Stub a cigaret in a napkin without burning it? Sure. Put a half-dollar underneath first. The metal coin absorbs the heat, prevents its affecting the cloth.



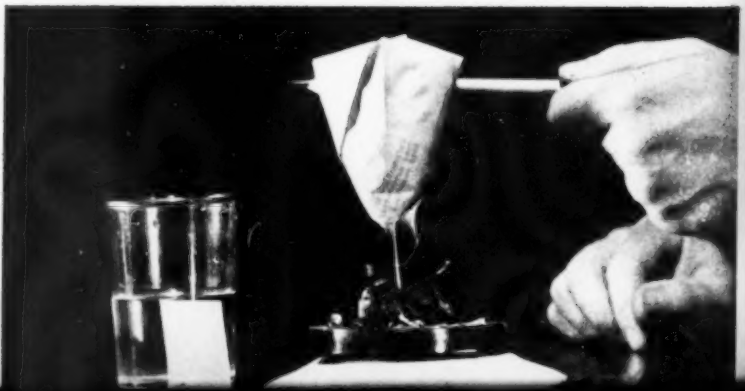
Below: Lay a match box on the back of your hand and close the cover so it pinches the skin. Bending fingers will cause box to stand or lie down. No, there's no pain.

Above: This trick is a sure magnet for attention: rub a glass rod on your suit, do the same with an inflated balloon. Placed together, the rod will act as a magnet for the balloon.



Left: Don't try this unless you cut two lumps from tomorrow's ration. Cigaret ashes on sugar act as a catalyst, enabling it to burn. Normally, it won't.

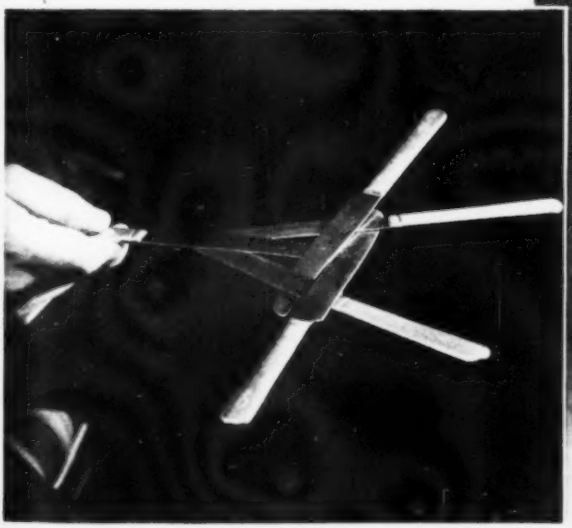
Right: Ever boil water in a sheet of paper? Easy: fold it into a cone, suspend it from a pencil over heat, which the water absorbs before it can act on the paper.



Right: It can't happen, you'll say. Ah, but watch. Into a tumbler full of water you can drop as many as 40 nickels (slugs here) without overflow due to the property of nickel of making water adhere closely to the surface. It's a sure bet!

Above: This is a law-abiding trick: the law of inertia is always abided by. Lay a dollar bill over the mouth of a tumbler and balance a coin on it over the rim. Jerk the bill away. The coin will remain.

Below: Hold your thumb and forefinger around an iced drink until very cold. Then you can pick up a cigaret like this without feeling the fire.



Four knives arranged as shown in the photograph can be picked up with another slipped into the group as indicated. Even if you fail it, this'll enliven that dull period that develops after dinner

Winged Death from the Deep

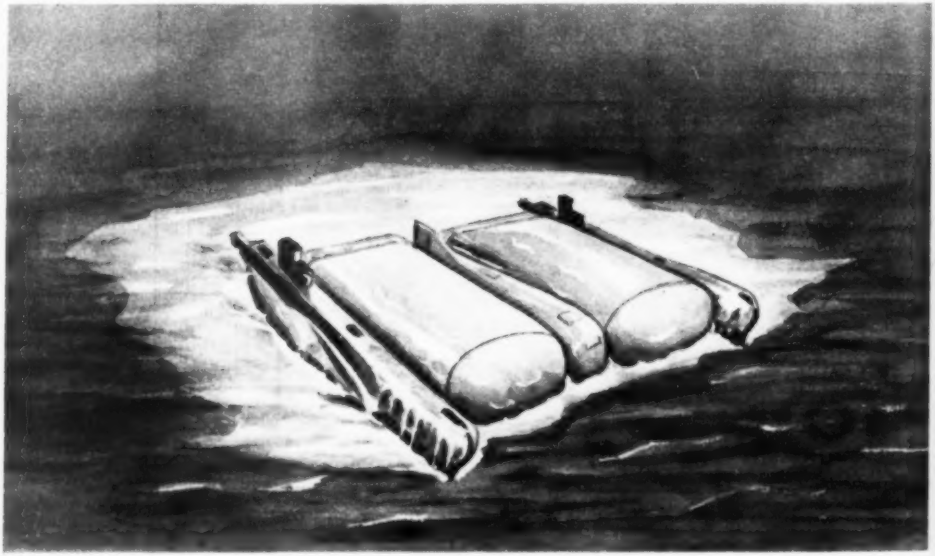
Submarine aircraft hangars lack the vulnerability of surface carriers, could sneak close to objectives with 12-18 bombers.

Submarine aircraft carriers have actually been built. That at left, Britain's M-2, indicates a development which Mr. Emery has logically extended.

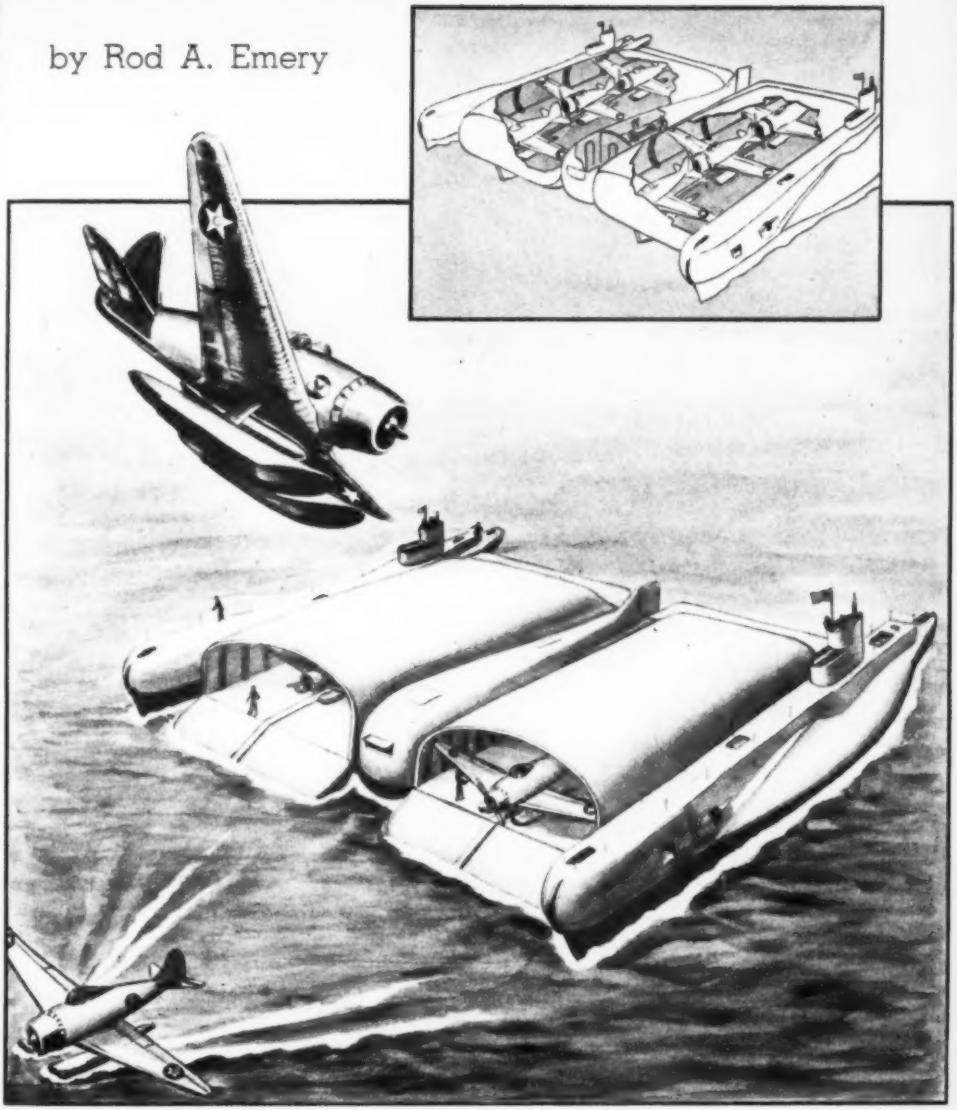
WITH every day's war news reports bringing new evidence that victory will come about only through the superiority of our air power, serious consideration is being given to the proposal we build an armada of a revolutionary type of submarine aircraft carrier. The form this might take is shown in these drawings.

The design is a logical extension of such small beginnings as the single-plane chamber which has been experimentally and successfully added to submarines in a number of cases (see photograph this page). Two shell-like structures of steel hold six planes of the rigid-wing type (as many as 18 of the folding-wing kind could be stored), flanking a whale-shaped unit containing plane supplies and quarters for personnel not otherwise accommodated. The subs proper resemble the conventional type in many respects, but of course

Mr. Emery's double shell-like underwater hangar would look like this as it surfaces in readiness to release bombers.



by Rod A. Emery



Hangar doors let down to become ramps down which the pontooned bombers slide for take-off. *Above*, cut-away view.

are vastly more powerful in submerging and maneuvering.

Of special steel alloys and uniquely braced to withstand undersea pressures, the hangars drop their rounded-front doors upon surfacing to form ramps for lowering pontoon-equipped fighter or bomber monoplanes.

Advantage of such a revolutionary-type craft are many and obvious. They do not have the vulnerability of familiar war vessels and especially aircraft carriers. The latter type's broad deck and complex machinery have made them discouragingly susceptible to air attack, as sinkings on both sides already have now decisively proved. The submarine carrier overcomes those disadvantages, and can sneak close to objectives with a cache of planes with load devoted to bombs. Heavy extra supplies of gas would not be needed for a long flight from the home base, as now.

Gunners Up!

A U. S. Army gunnery cadet streams bullets toward his practice target, a plane-towed sleeve called a *drogue*.

Fly in aerial gunnery practice with the bomber crew member who fights off the enemy!

by Flying Officer John L. Scherer, R.C.A.F.

ALTHOUGH reflecting the glory that falls to the military pilot, the air gunner never has received the acclaim due him as a fighting man. However, it is the pilot—the man who knows—who is first to credit the gunner for doing a job of A-1 importance. He knows that the air gunner (AG) is the fellow who makes it possible for the bomber to reach its objective and return home again. The best pilot's, navigator's and bombardier's efforts would be forfeit if the gunner were not on the job to fight off the enemy aircraft that are almost certain to harry the bomber on its mission over enemy country.

Generally short in stature—the better to fit into the small gun turrets—gunners are "big little fellows" who are long on courage, possess keen eyes and an even keener intelligence. They must be able to make instant decisions, yet remain calm and cool under fire.

The AG has to be good—if he wants to survive. He has to get the other fellow first. That means shooting more quickly and accurately than whatever number of enemy aircraft may attack from any direction at any second of the four to twelve hours of a bombing or scouting mission.

That an air gunner must be given the best possible training prior to actual combat is fundamental to reliance on his carrying out his important job in a manner calculated to provide maximum safety to the crew of the plane in which he flies. This fact is keenly appreciated by the authorities responsible for planning and executing the training of air gunners for the Royal Air Force and Royal Canadian Air Force which I shall detail here. Their training procedure was adopted practically *in toto* by the United States when instruction and practice of our aerial gunners were stepped up. That should be convincing

SONG OF THE AERIAL GUNNERS

I wished to be a pilot, and you along with me,
But if we all were pilots, where would the Air Force be?
It takes GUTS to be a gunner, to sit out in the tail,
When the Messerschmitts are coming, and the slugs begin to wail.
The pilot's just a chauffeur, it's his job to fly the plane,
But's it's WE who do the fighting, though we may not get the fame.
If we must all be gunners, then let us make this bet:
We'll be the best damn gunners that have left this station yet!

This is it!—hydraulically-operated gun turret which a bomber's gunner can rotate in any direction to ward off attacking fighters.

proof that its excellence is recognized by United Nations military experts.

Before taking you on an imaginary visit to a Bombing and Gunnery School where, as an officer in the R. C. A. F., I helped to train air gunners, I want to point out that the air gunner is also a wireless operator. He differs from a pilot or observer in that he is not enlisted just as aircrew, but as a wireless operator-air gunner or WAG.

The WAG's training is directed to this dual job right from the start. From the manning depot he is sent to a wireless school where he completes a course consisting of classroom work on Morse code, mathematics, anti-gas defense, air force law, etc. Emphasis, of course, is placed on the Morse signaling—by buzzer, semaphore and lamp.

For many weeks the student WAG spends all his time on the ground mastering the radio theory and practice which will train him for handling two-way communication between plane and land. After he has shown that he knows his ground school lessons well, the WAG takes to the air. The flying is in large Norseman single-engine aircraft (550 horsepower) which carry a pilot, wireless instructor, and four student WAGS. Cross-country flights are made during which the students maintain two-way communication between the plane and several ground stations.

(Above) Ready for an exercise, gunner aims gun at target below from Fairey Battle. *(Left)* Previously the exercise had been explained to cadets with wire-suspended models by author Scherer (with pencil).

Upon completing his course at the wireless school, the WAG is given his "sparks"—an arm badge that shows a hand clenched around three lightning bolts. This signifies that he is a qualified wireless operator—the fellow who gets bearings by which the observer calculates position, and the chap who keeps the aircraft in touch with the ground staff while on a mission.

The WAG is now ready to undertake the second half of his training. He moves on to a bombing and gunnery school for an intensive course in gunnery. Make an imaginary visit to the school (No. 1) located at Jarvis on the north shore of Lake Erie and I'll show you how the WAG wins his coveted half-wing with the letters AG encircled by a Victory Wreath.

Assume that I have met you at the gate and passed you by the armed sentries. We'll visit the flying line and see what type of airplane it is in which the student gunners go aloft. See that line of long, bullet-shaped aircraft? They are Fairey Battles. They were not built to train gunners, but when they were retired from active service overseas because they had become obsolete—too slow at 280 m.p.h.—they were pressed into training service. They're doing a first class job.

The Battle looks like a large edition of a Hurricane fighter. It is powered by a single engine of 1030 horsepower—a Merlin Rolls-Royce, the same make of motor that powers the Spitfire. Hurricane and the American Warhawk. It has a maximum speed of 287 m.p.h., cruises at 200, and lands at about 85 m.p.h. It weighs about 6½

Tracer bullets from a Warhawk's wing guns here show the deadly heavy fire with which an aerial machine-gunner stands off attack.

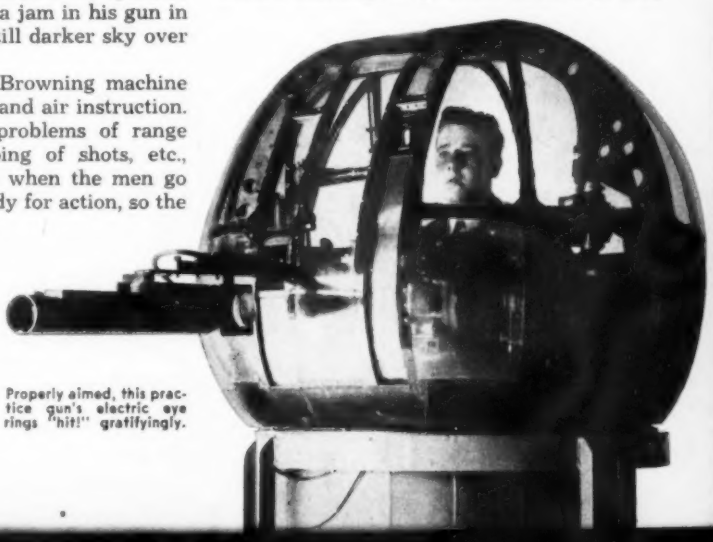
tons. Quite an impressive looking job, eh?

Before the student gunner is sent aloft to indulge in actual air firing, he must attend classroom lectures on the construction and operation of the weapons he will use. By the time he has completed his ground school training at the gunnery school he will be able to take down and assemble his machine guns blindfolded! That will come in handy some night when he is clearing a jam in his gun in a darkened aircraft in a still darker sky over enemy land.

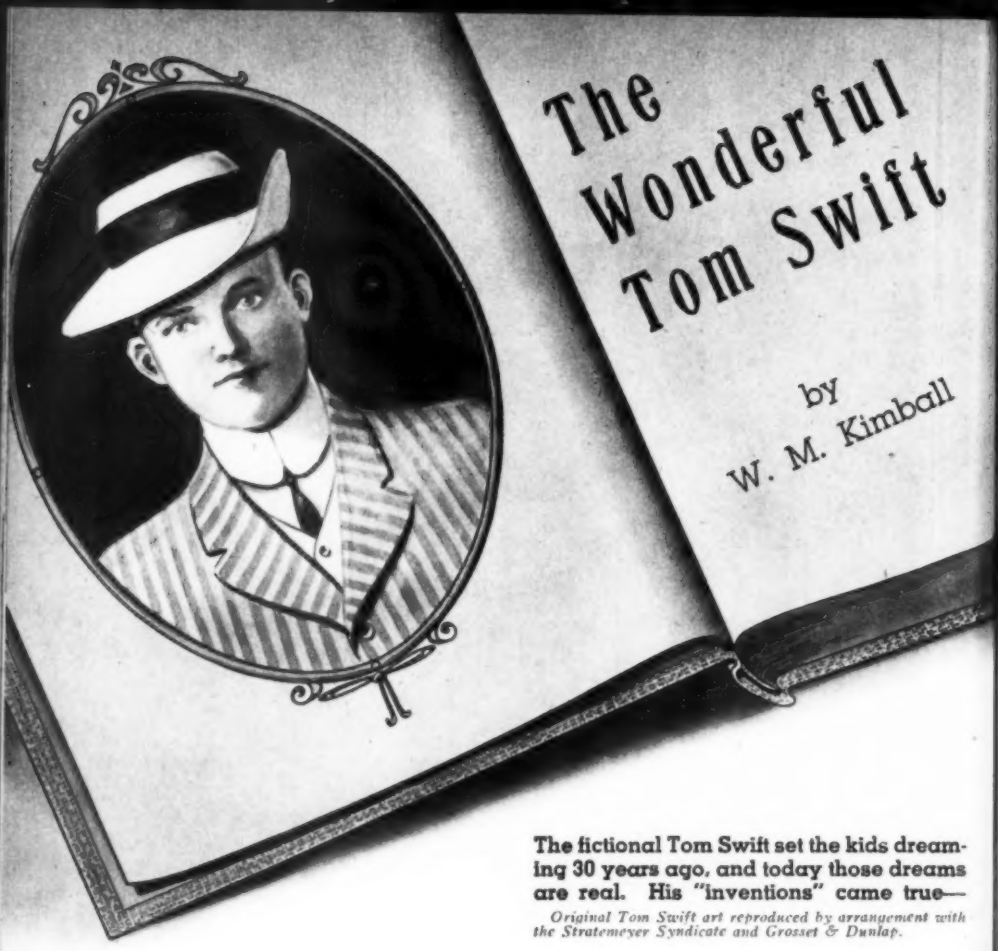
The Vickers G.O. and Browning machine guns are used for ground and air instruction. They involve the same problems of range estimation, timing, grouping of shots, etc., as later types. However, when the men go overseas they must be ready for action, so the gunners also learn to aim and fire all the latest types of armament.

When a gunner spots a plane in the sky he is concerned with three basic problems: 1. Recognition (friend or foe). 2. Range estimation—when is the enemy plane within range? Bullets must not be wasted. 3. Relative speed—the enemy plane may be flying forward, backward, up or down or in a combined direction with relation to the gunner's aircraft. The machine gun must be aimed accordingly.

The entire gunnery training is directed toward teaching the [*Continued on page* 161]



Properly aimed, this practice gun's electric eye rings "hit!" gratifyingly.



The fictional Tom Swift set the kids dreaming 30 years ago, and today those dreams are real. His "inventions" came true—

Original Tom Swift art reproduced by arrangement with the Stratemeyer Syndicate and Grosset & Dunlap.

THERE'S a fellow who never got outside the board covers of his books who is going to do a lot to win this war.

He's still stalking through pages of new adventures—still the "intrepid young inventor"; still the keen-eyed stalwart who began his career of genius on a motorcycle.

He's the fellow who invented ALL the machines in use on the farflung fronts of war today—in fiction. Who could this youth be who gave the world his "Aerial Warship," the "Submarine Boat," the "Sky Train," the "Giant Cannon," the "Photo Telephone?"

In short, as Victor Appleton, his creator would say, who could this youth be other than the wonderful TOM SWIFT?

To "Victor Appleton" must go the credit for endowing young Tom Swift with the vision and ability of a thousand scientific minds—the credit for constructing from the mere glimmer of a scientific report fantastic machines that operated on land, under the sea and in the air—just as they operate today some *thirty-odd years* after the first Tom Swift book was published.

Some of us creaky oldsters remember the fictional birth of Tom Swift in the volume "Tom Swift and His Motorcycle." We remember the surreptitious borrowings, the Tom Swift sessions in the haymow and the forbidden reading by flashlight under the covers after the rest of the house had retired.

And some of the young fellows—riding dispatches in Australia now on modern counterparts of Tom Swift's wonderful machine—can remember digging that same book out from a dusty attic pile on a rainy day.

Tom Swift is responsible in a good measure

for imbuing Americans with the respect and admiration for mechanical perfection that will, when this war is over, be the distinctive mark of America's armed forces.

Tom Swift never was licked. He never had a failure that remained a failure. And his inventive genius could not have been surpassed by a composite Edison, Steinmetz, Simon Lake, Wright and Marconi.

He was the Captain Marvel of his day, triumphing over evil in the form of "that sneak, Andy Foger" and his foul companions, Sam Snedecker and Pete Bailey.

The tools of "a syndicate of rich men," the Happy Harry Gang, set upon Tom as he sped his father's "valuable patent model" from the fictional town of Shopton toward Albany—and thus launched Tom Swift on a career that has been told and retold in some 7,500,000 volumes.

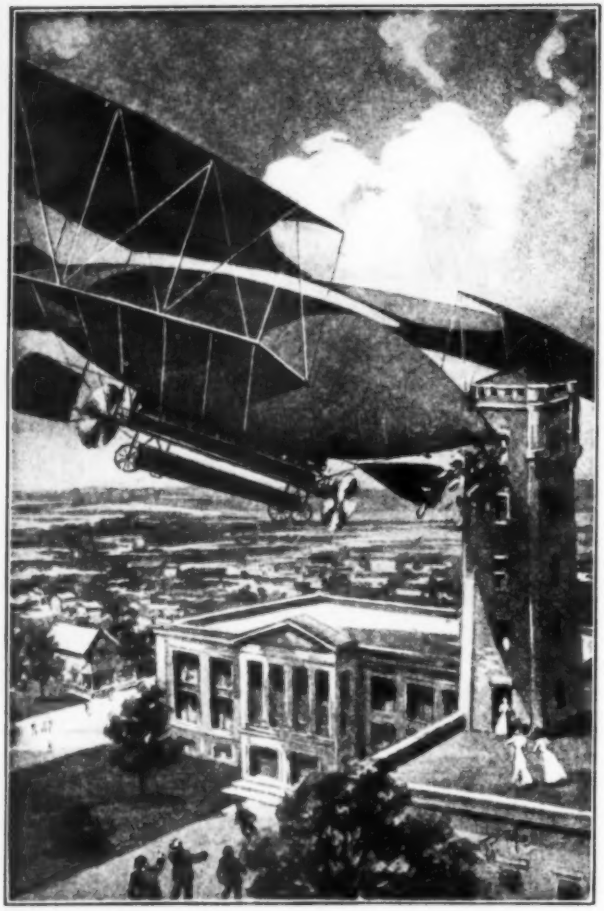
Tom's progress thereafter in the scientific world was as swift as his name. No sooner had his motorcycle adventure ended than he was afloat in his motorboat *Arrow* on the waters of Lake Carlopa. He bested Andy Foger and his ilk there in a thrilling race.

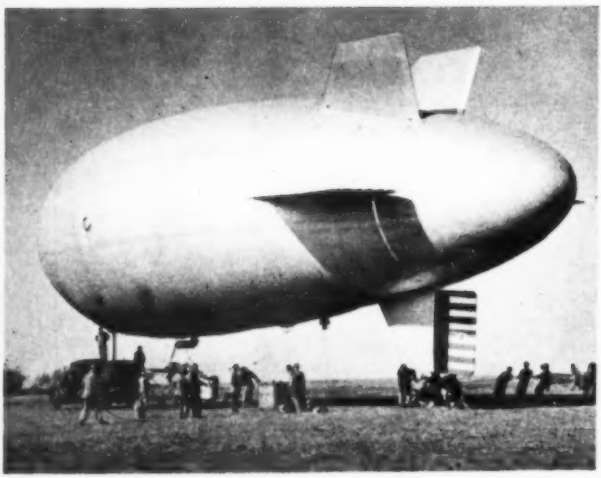
His adventures included the rescue of "an intrepid aeronaut" when aeronauts were called just that and rode aloft in gas-filled balloons. The aeronaut became Tom's staunch friend—and paved the way for Tom's adventures in the air. And Tom had other friends too. Few of us will forget the ever cheerful Wakefield Damon and his knack of brightening up critical situations with "Bless my shoelace!"

"Come Josephine, in My Flying Machine" was just getting a good tryout on the Albee circuit when Tom Swift put wings on a balloon and thus created "His Airship," the *Red Cloud*.

The boys in the haymow said,

Thirty-four years ago, who'd have thought Tom Swift's War Tank *(above)* was even vaguely possible. The kids who read about it thought so. Today Tom Swift's War Tank is real, the kids have grown up to build them and drive them, as in U. S. Army Signal Corps Photo below. Like Tom's tank, they now carry radios.





Left: Tom Swift's aluminum covered "Red Cloud" pioneered the blimps of fiction. Today U. S. blimps *(below)* spot subs.

"Goll-ee! He's wonderful!" And their parents sniffed and said "Ridiculous! Such trash!"

But some of those parents still live—and read about the successes of the Navy's blimps in their hunt for the bandits of the sea—the blimps that have fins and rudders and motors and propellers, just like the *Red Cloud.*

Ah! But the *Red Cloud* had another refinement. Its gas "bag" was no flimsy silk. It was aluminum! In 1910, at that. Remember? It was several years after World War I before Henry Ford demonstrated the practical utility of the all-metal airplane. Then came the all-metal *ZMC-2* and the *City of Glendale,* all-metal dirigibles.

Tom's adventures in the *Red Cloud,* harried as they were by Andy Foger and Happy Harry's gang of bank robbers ended—as you might suspect—in triumph for the young inventor.

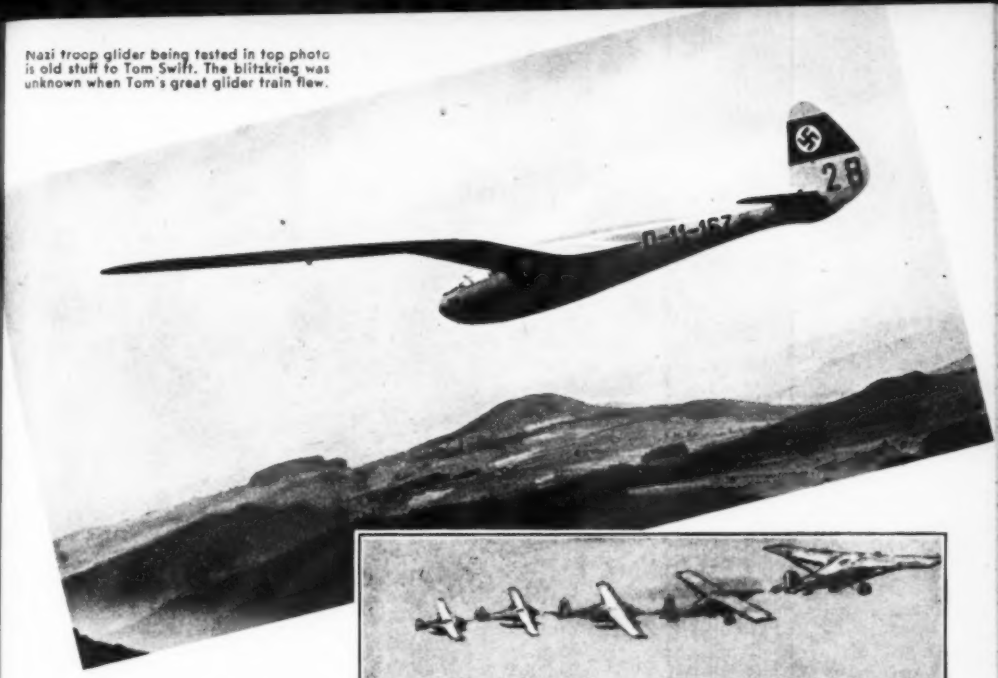
Falsely accused by that sneak, Andy, he led the sheriff to the lair of the real bank robbers—the first time a sheriff had ever staged a bandit hunt by air. Needless to say, the feat has been often repeated since in real life.

It was a "valuable government prize" that turned young Tom's inventive mind to the depths of the sea—and a means to traverse it. "Tom Swift and His Submarine Boat" performed miracles of undersea navigation—miracles that Victor Appleton explained to the complete satisfaction of boyhood's exacting imagination.

And as nothing is impossible to the willing reader, the mechanics of Tom's undersea boat were explained very simply.

It was Tom's father, the "aged inventor," whose genius provided the novel means of

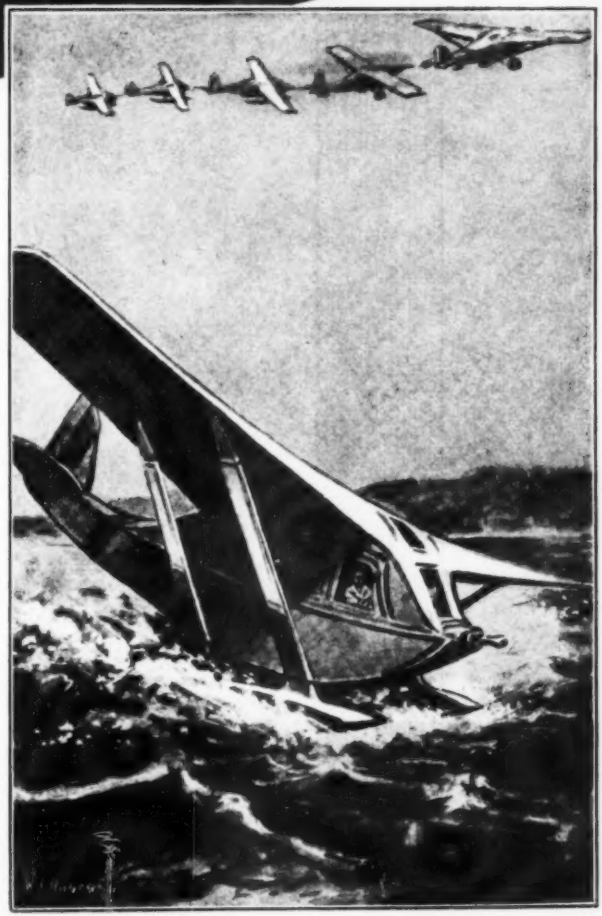
Nazi troop glider being tested in top photo is old stuff to Tom Swift. The blitzkrieg was unknown when Tom's great glider train flew.



propelling the craft. He did not want to "depend on the usual screw propellers . . . nor did he want to use a jet of compressed air, shooting it out from a rear tube, nor yet a jet of water, by means of which the creature called the squid shoots himself along," explained the author. "Mr. Swift planned to send the *Advance* along under water by means of electricity." (As what submarine builder doesn't today?)

But the Swift "patent idea" was revolutionary!

"Certain peculiar plates were built at the forward and aft blunt noses of the submarine," the description continues. "Into the forward plate a negative charge of electricity was sent, and into the one at the rear a positive charge, just as one end of a horseshoe magnet is positive and will repel a compass needle, while the other pole of a magnet is negative and will attract it. In electricity like repels like, while negative and [*Continued on page* 174]



You're RIGHT — That's WRONG

Here are 25 statements, some of them true, the others false. The trick is to separate the *true* statements from the *false* ones—and it isn't as easy as it looks! Use a pen or pencil and check the correct box under each statement and see how you make out! After you've given yourself the test, try it out on friends and other members of the family and compare scores. They'll enjoy it and so will you.

Are you ready? Let's go!

1. Argon is a rare metal used to harden alloys of aluminum, copper and magnesium.
   True ☐ False ☐

2. A baked-apple is the fruit that grows on the cloudberry plant, which is a kind of raspberry.
   True ☐ False ☐

3. Sea peaches and sea potatoes are types of underwater plants that take root in shallow coves.
   True ☐ False ☐

4. Tin plague is not a disease contracted by workmen handling molten tin during the refining process.
   True ☐ False ☐

5. An anemometer is used by biologists to determine the approximate number of anemones per cubic foot of sea water.
   True ☐ False ☐

6. Phonography is not the process of making phonograph records from smooth discs, but a system of shorthand invented by Isaac Pitman.
   True ☐ False ☐

7. The term "trench mortar" applies to a type of plaster made by mixing lime and mud with water.
   True ☐ False ☐

8. A pillow block is a wooden head rest used to reduce the fatigue of an automatic screw machine operator.
   True ☐ False ☐

9. The solar plexus is not the rim of light outlining the sun during an eclipse, but a part of the human body.
   True ☐ False ☐

10. A battery is any single cell furnishing electric current.
    True ☐ False ☐

11. A Corona Australid is not a fine cigar made from the highest grade Australian tobacco, but a meteor of a particular constellation.
    True ☐ False ☐

12. The term "magnetic dip" is a slang term used by detectives to indicate a pickpocket with a likeable personality.
    True ☐ False ☐

13. The stratosphere is higher in summer than it is in winter.
    True ☐ False ☐

14. The house wren is so wary of scarecrows that it won't even fly over a field containing one.
    True ☐ False ☐

15. The dark meat of a chicken contains about twice as much vitamin B as the light meat.
    True ☐ False ☐

16. Rubber compressed to the hardness of steel can be used to cut metal with precision.
    True ☐ False ☐

17. Bats can guide themselves through dark passageways by listening to the echoes of their own shrieks, which are too high pitched to be heard by human ears.
    True ☐ False ☐

18. The average octopus is so timid that it changes color with fear when attempting to escape.
    True ☐ False ☐

19. The termite is one of the most exclusive members of the insect kingdom, never permitting any other insect to enter its nest.
    True ☐ False ☐

20. There is enough salt in the seas to cover the dry land of the world to a depth of 400 feet.
    True ☐ False ☐

21. A cow doesn't have to eat garlic to flavor her milk, all she has to do is smell garlic for 10 minutes.
    True ☐ False ☐

22. Although we put salt on our food, ordinary table salt is made up of two deadly poisons, sodium and chlorine.
    True ☐ False ☐

23. Adult penguins allow their young to shift for themselves as soon as they can stand up.
    True ☐ False ☐

24. The tiny hummingbird, which can stand still in mid-air, can also make non-stop flights as long as 500 miles.
    True ☐ False ☐

25. A tool post is a tall wooden upright used in a workshop to keep hand tools in easy reach.
    True ☐ False ☐

WHAT'S YOUR SCORE?

To get your score simply give yourself 4 points for every question you answer correctly and total the result. If your mark is above 90, you are exceptional; if it is between 80 and 90, you deserve high praise; if it's between 70 and 80, you're good; between 60 and 70, fair; and below 60—well, try again next month!

Answers will be found on page 165

NEWS OF SCIENCE AND MECHANICS

RENTS RUBBER TIRES
ACTOR-GADGETEER—
SHOCKED TO SANITY—
RIVER SEES THE DOC

He Bats 'Em Down

DECK landings on the aircraft-carrier H.M.S. *Illustrious* are controlled by a senior officer, himself a highly skilled pilot, who signals the aircraft down to deck with illuminated reflector "bats," telling the pilot (who can't see the deck on which he's landing) how to maneuver safely. The planes used are U.S.-built Martlet fighters.

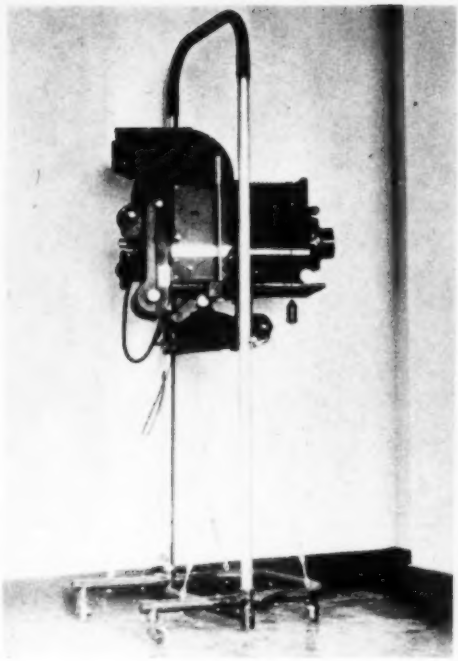
No Sale—But Will Rent

LOGICAL development out of the tire rationing situation is Daytona Beach, Fla.'s tire-lending library. Stranded motorists, like Johnette Massey above, now can borrow a used tire from Jack Mather, furniture dealer, for a small rental fee. After they get home with the borrowed shoe, they send it back for more loans. It's become a neat little side line for the furniture business!

He Laughed, Steelily

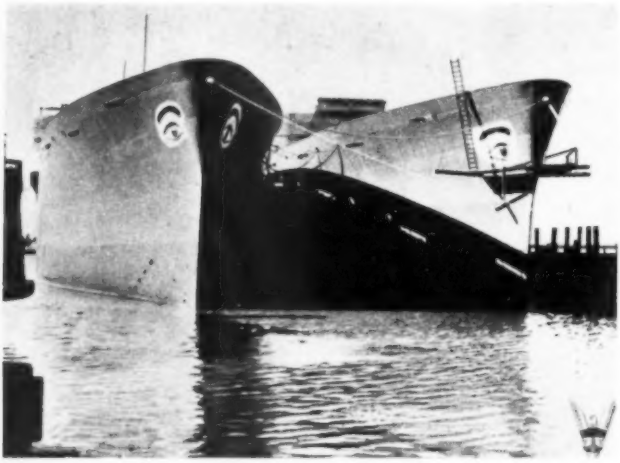
AFTER wearing out several sets of teeth made by dentists, Ralph E. Young of Ogdensburg, N. Y., resorted to his workshop. There he made a durable set of steel ones out of a kitchen kettle. Brushing them is no chore—they're stainless steel, of course!

Does steel for teeth rate priority?



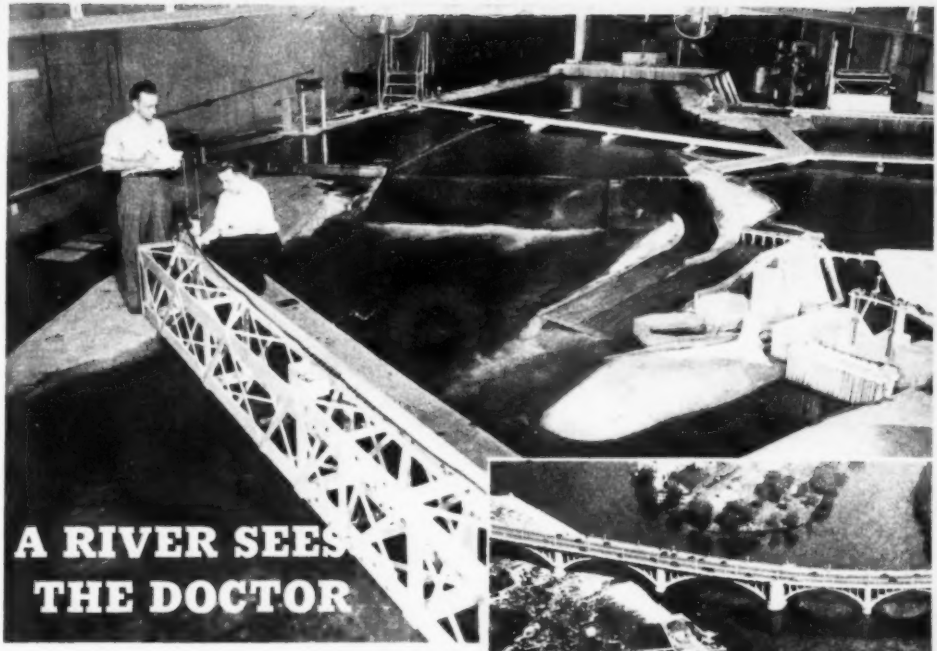
Can't Double-Expose

FULLY electrical, this camera has a shutter operated by a bulb which closes a contact so that it can be used effectively at any distance. After an exposure, the shutter is electrically reset and the film moved. Double exposures are impossible. Different size photos can be taken on the same roll.



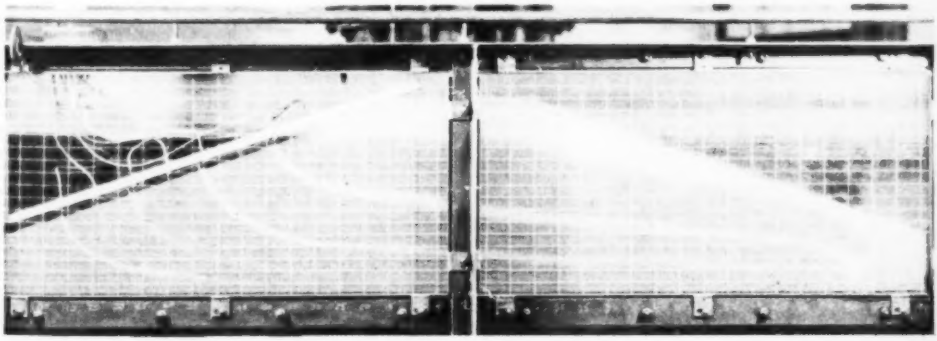
Will New Ships Stare Down Subs?

MANY ship yards still find time to paint eyes on ship bows. Done today mainly for luck, the old custom comes from the Chinese, who gave all ships eyes for protection against the perils of the sea. They didn't dream such perils might include submarines needing to be spied and attacked with weapons deadlier than glares.



A RIVER SEES THE DOCTOR

HOW the Mississippi river can be doctored is worked out in advance inexpensively at the University of Minnesota's Hydraulic Laboratory where a model scaled one foot to every 50 feet of river permits study and experiment. A part of mid-Minneapolis appears at right in an aerial photograph just below its reproduction in miniature. A cycle of river events actually taking weeks can be imitated by the model in hours. The model, 160 ft. long and 36 ft. wide, includes dams, tributaries, canals, etc.; and test controls are built in for tests. Below, earth dam design is checked through glass, dyes (white lines) tracing seepage.

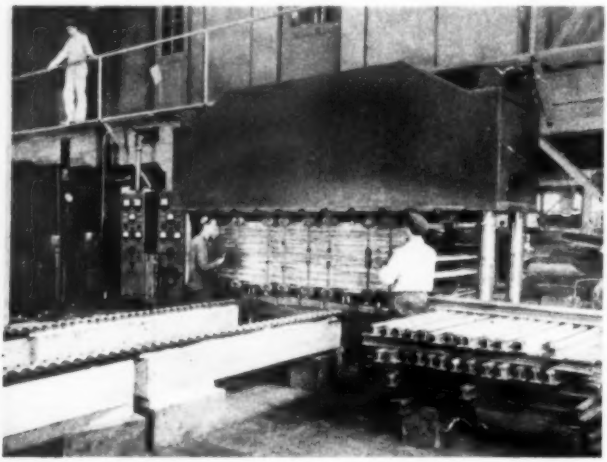


Take A Hunk Of Plywood . . .

THIS adult's bicycle was built by Dr. Don Truitt, above, of Long Beach, Calif., in a wacky solution to the rubber and metals shortage. A lumbering adaptation of wheels of the 19th Century, it's being ridden by Lorrain Foreman. Entirely of wood except for bolts and pedal gear, it has a front wheel cut from a 48-inch square of plywood.

Plastic Plane Pontoons

POWEL CROSLEY III holds a new, priorities-conscious plane pontoon molded of plastic without heat or pressure. Perhaps heralding a new plastic use, it's as light and strong as pontoons of now-scarce aluminum, costs only half as much in production models, permits quicker takeoffs through eliminating drag caused by rivets and seams.



Heavier Plywood Baked By Cold Heat

THE common hot press method has given way in one Pacific northwest factory to high-frequency waves—300,000 watts in strength!—which bond plywood's various layers with "cold heat." Production time is cut from two hours to seven minutes. Heavier plywood can be made, as the electronic activity is distributed through the layers—the usual steam-heated iron plates would char.

Shocked Into Sanity

NEW hope for victims of manic-depressive psychoses has been created by this electric shock treatment at Patton State Hospital near San Bernardino, Calif. Electrodes held against the patient's head by rubber bands deliver the jolt required to remedy short circuits in the brain's switchboard. Devised by Cal Tech, rig at rear doles out current.

No More Glue Licking?

CAPITALIZING on coin-operated machines' popularity, this mailbox automatically stamps, postmarks, mails letters, ending complaints about glue flavor! Postage is regulated by dropping in coins and adjusting knobs. Manufacture of the Mailomat is halted until peace, when quantity production will help take up post-war slack.

Paint Sprayer Powers Overgrown Kiddie Car

LIKE many MI workshoppers, mechanic F. F. Smith of East Point, Ga., devised his own answers to the tire and fuel shortage by building Lolley, an overgrown kiddie car that a paint sprayer's ½-h.p. engine drives along at 20 m.p.h., giving 40-50 miles per gallon. Using three 12-inch tires, Lolley has a framework of bed rails and Ford fan-belts to drive the rear wheels. Rides are plenty airy, tho.

ACTOR-GADGETEER

HUSKY movie player Alan Hale, despite his long service in films, says he'd go nuts if he did nothing but act. So he invents household gadgets and novelties as a hobby. Among them are greaseless potato chips that will last for years, sliding theater seats, and an automobile brake! In the photograph above, Hale is fastening to the wall a home-size fire extinguisher more compact than the commercial type built for factories and office buildings and easy for a woman to use.

At left below, the actor demonstrates a Venetian blind attachment he devised so that the lower half may be closed, the upper half left open for light and air.

Above, he inserts trousers in the Hale suit-presser. The main part presses pants while the rack at the rear holds coat and vest. Clothing given over to care of the gadget at night is pressed neatly by breakfast-time! Hale points out that devices like this are attracting particular interest with the public now because of the war necessity of making clothes look and wear well as long as possible.

Hale's leisure-time interests were directed to mechanical improvements on existing appliances and furnishings, and to devising ingenious new gadgets, by the technological changes and originations which he has seen developed during his Hollywood career by the production officials and crews in the film studios.

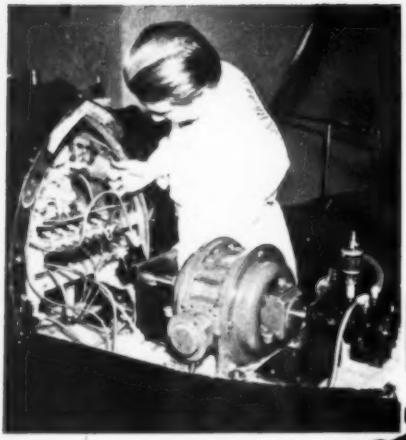
NEWS OF MODERN WARFARE

Axis Vultures Beware: This Is Our Warhawk

SUCCESSOR to the famed Curtiss Tomahawk and Kittyhawk is the even faster, higher-climbing Warhawk above, demonstrated at Buffalo, N. Y. First U. S. military type fighter plane powered with the new American-built Rolls-Royce engine, the Warhawk carries extra fuel in a cartridge-like container which can be dropped when empty. Warhawks are one reason the American eagle screams in avenging confidence!

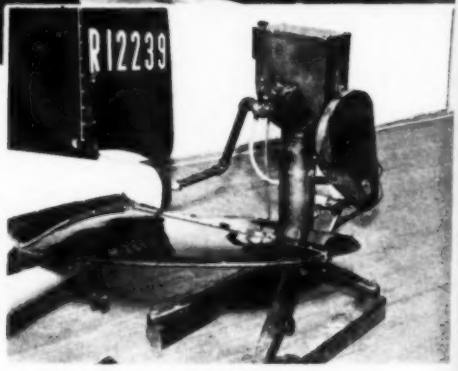
Rubber Web Saves Family

SPIDERWEBS aren't fragile, shiver-causing networks when they're made of cellular rubber disks gathered on ropes into precious life rafts. This rubber is twice as light as cork, resists rot, oil, acid, vermin, fire. Such rafts can be cast overboard when there's no time for lifeboats.



Failure Isn't Fatal In This

THIS plane tied to an aviation school floor equals the Link trainer in taking attitudes of pupils' level flight, banks, dives, and climbs (motor drive unit, photo at bottom), and excels it in bringing to life instrument-operating principles a student studies, and results of repair and overhaul. If he's been inaccurate he can trouble-shoot a lot more safely than in the air! Automatic pilot depends on motor, left.



Bomb That Fires Bullets

THIS bullet-bomb invented by A. G. Howard of Lincoln, Neb., is a triple-threat plaything—it spreads death and injury by bullets, and demolition by TNT! Dropped from a plane above ack-ack, the missile is timed to start firing bullets vertically (lower finger points to bullet chamber). Landing, the detonator explodes bullets horizontally from upper chamber to cripple troops at knee-height, then by a secret mechanism explodes.

Britain's Givin' 'Em Halifaxes!

IN ONE of its first pictures, England's Handley-Page four-engined Halifax bomber spreads its black wings awesomely above a line of more than 50 men. Weighing 27 tons when fully loaded, it can speed 300 m.p.h., range 3,000 miles, carry a 5½-ton load of bombs. The Halifax has a crew of seven.

Devil Dogs Learn To 'Chute Without 'Chutes

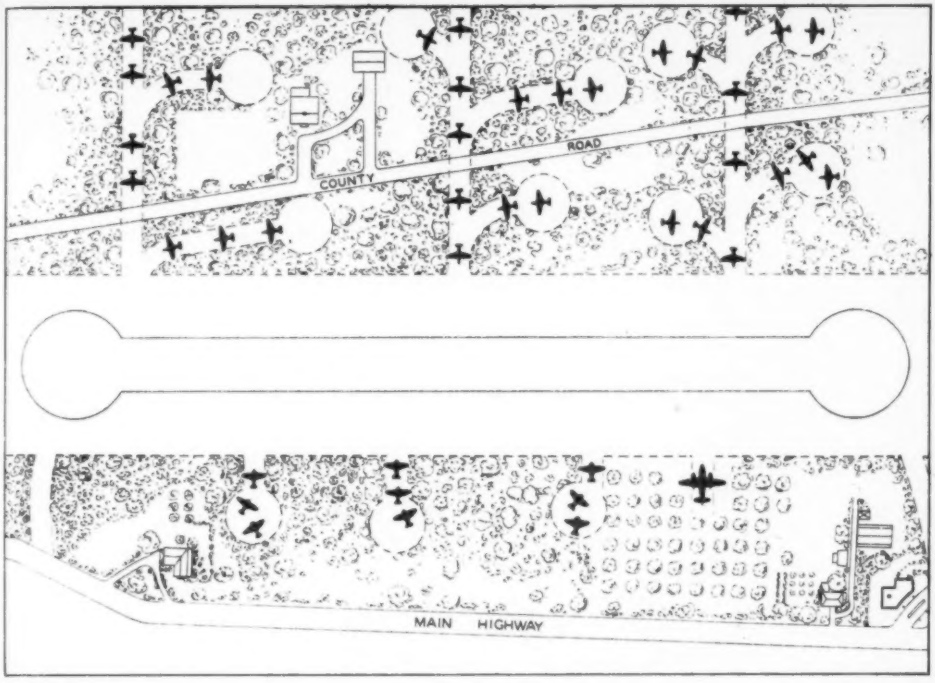
WITH 250-foot training towers like that at left, U. S. Marines at San Diego, Calif., are learning parachute jumping—without 'chutes! At the tower's top, the leatherneck above hangs head down in normal diving position waiting to pull the rip cord (note his right hand). The looped lines will jerk him to a stop with a whirling snap after his 15-foot free fall.

"Umbrella" of Kite Balloons Protects Ships

DICE-PATTERNED kite balloons, little sisters of the barrage type, have accounted for more than six Nazi planes attacking British Isles coastal vessels, saved 200 ships. First distrustful, merchant skippers now swear by the airy globules which form a protecting umbrella over a convoy (above). At right, a Naval lighter is receiving a balloon from a depot barge, to take it to a ship in a waiting convoy.

Marines Hoist In Their New "Bull-pup"

SO EAGER were the Marines to test a Crosley "baby jeep" scout car, a squad went to fetch it to their Quantico, Va., station in a transport plane. It's first time a military car has been so carried! Half the weight of a jeep, the "bull pup" has six forward speeds, 4-wheel drive, goes 50 m.p.h., carries two. The Marines may parachute it from planes!



"FLIGHT STRIPS" TO EDGE HIGHWAYS

SPEEDER-CHASING highway policemen who hide in concealed byways with their motorcycles, ready to pursue law-flouting motorists, are being succeeded by army pilots and planes along certain parts of the dual-strip Pennsylvania Turnpike. Not to chase speeders—road or sky type—but in demonstration of how the usefulness of wide, smooth American highways can be extended to planes forced down between regular landing fields. The plan above of a "flight strip" as developed by the U. S. Army calls for short makeshift runways leading from the highway to tree-hidden areas to which planes could be taxied. There they could undergo needed repairs or servicing, or lie in wait unperceived by hostile aircraft, until ready to move back onto the turnpike. Unusually straight and level, it makes an efficient runway, as the army bomber below is proving.

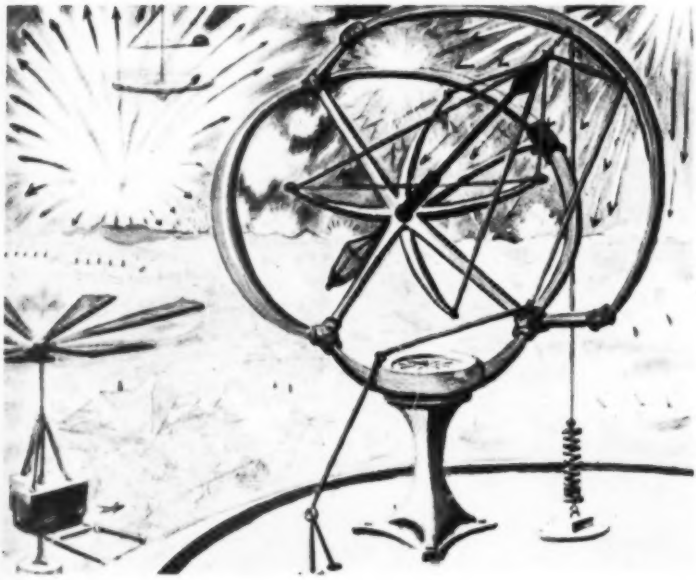
"Turtle troops" withdraw into shells, fleeing tornado, reaper.

Tomorrow--

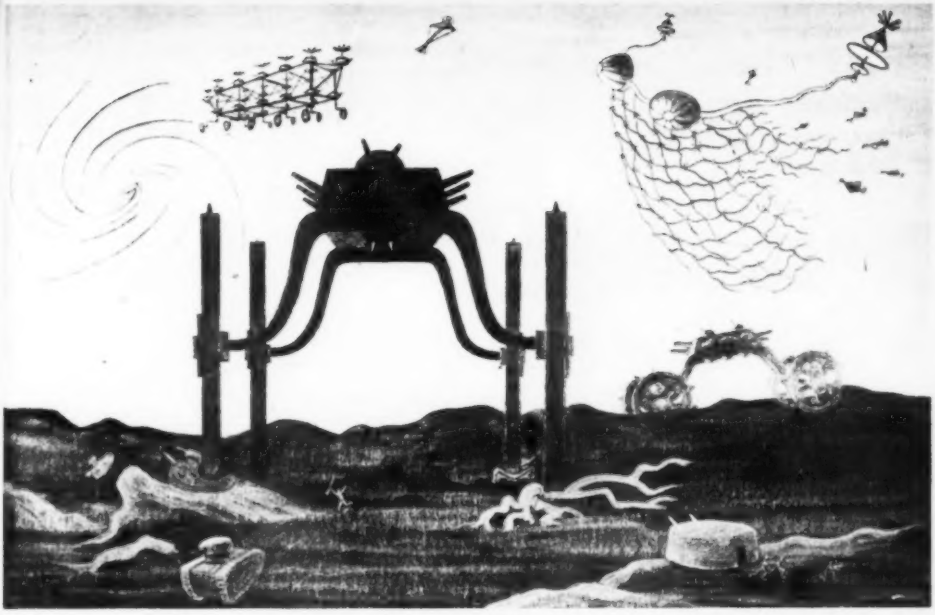
MECHANISTIC MONSTERS?

SIRED by surrealism, and out of nightmares with antecedents in the terrors of mechanized war, are these deadly monster-like machines with electrical, if any, souls. They're the dread offspring of an apparently tortured but technically ingenious imagination—that of artist Clay Spohn of California, who put them on canvas in the last year or so. The San Francisco Museum of Art exhibited these four and others recently under the title "Fantastic War Machines and Guerragraphs."

A bombproof plastic shell into which the soldier can withdraw, tortoise-like, is suggested by Spohn in one painting (top, page 90) in which attack comes from a terrifying man-made tornado and a sky-reaper—a plane trailing bombs on



Dart-bomber hurls shells which burst and scatter others.

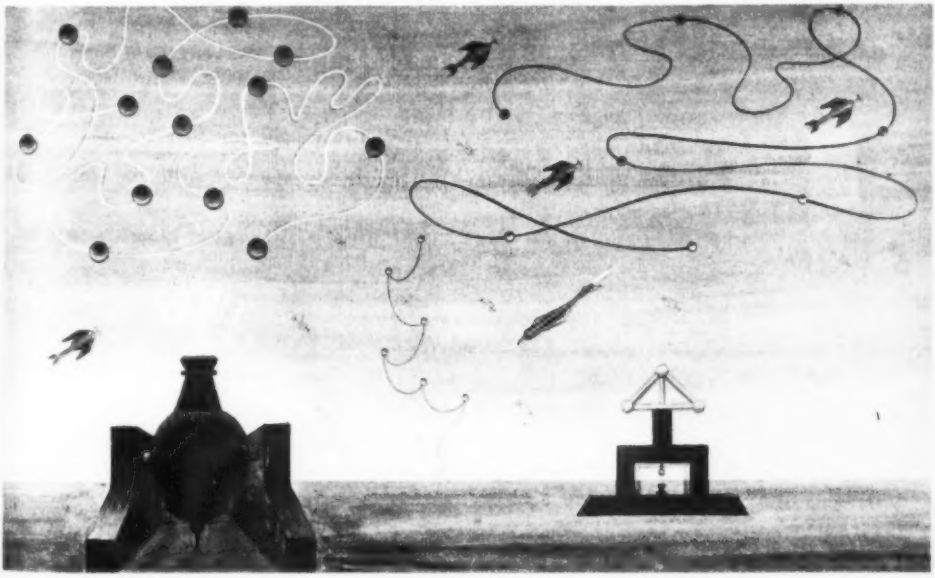


Tough on aviators—bolo-like trap hurled aloft by a cannon.

long cables. Spohn's dart-bomber (bottom, page 90) uses the principle of the bow and arrow in a mechanical device which hurls rocket bomb shells. They burst in the sky like fatal fireworks, scattering small bombs.

Doubtless impractical but still a diabolical possibility, according to the artist, is an immense rolling fort (top this page) with giant wheels that would crush any obstacle like a tank or pillbox fort. In the same painting Spohn shows flying [*Continued on page* 160]

No tank or pillbox could withstand this gigantic rolling fort.

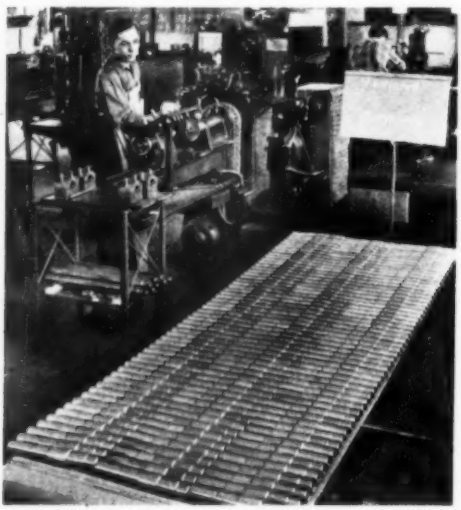


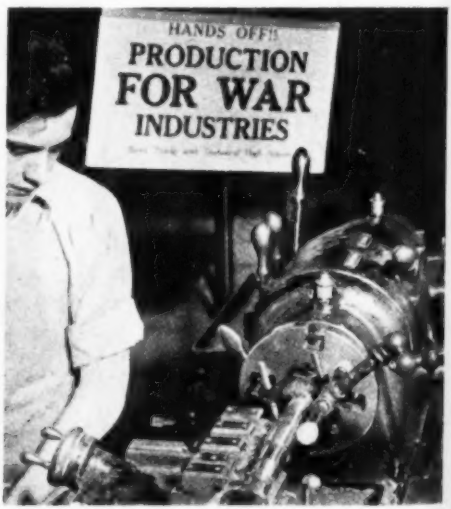
CLASSROOM WAR PLANT

WHEN priorities threatened to shut off metals for its machine shops, the Boys Trade and Technical High School in Milwaukee hit on the idea of becoming a subcontractor for Kearney & Trecker Corp., a local milling-machine maker loaded with defense work. The firm supplies materials which the schoolboys turn into simple parts during class periods, which thus become a short cut in training defense workers! Pupils gain experience in mass production and in meeting industry's exacting requirements — permissible tolerances for ground shafts: plus or minus .0005; on fractional dimensions: .005. Waste, the school warned Kearney & Trecker, might run 15%. The firm allowed 25%. Actual waste is under 3%!

The offered pay of $2.75 per man hour of work couldn't legally be accepted by pupils or school. Remuneration for the pupil-made gear segments, shafts and starting levers therefore may take the form of scholarships or more equipment.

In the top photo instructor Frederick H. Schoenig and pupil Donald Jacobson inspect shafts. Gang fixtures, for holding cutting tools, were designed by Mr. Schoenig. Left below, shafts ready for grinding; right below, Frank LaMalfa necking to shoulder.





CRAFTS AND HOBBIES

PHOTOGRAPHY
MODELS • RADIO
THE WORKSHOP
BOATS • SPORTS

REVERSE REFLEX FOCUSING

by Roger Clay

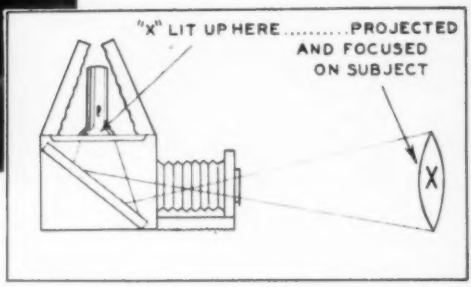


FIG. 1 (*above*): Focusing the Graflex, a typical single-lens reflex camera, with the projection focusing device. A searchlight with an "X" painted on its front is placed on the camera's focusing screen (diagram, *right*) and the image of the "X" is projected on to the surface of the subject. When the projected "X-image" is sharp, the lens is in focus.

THERE'S no denying the fact that when it comes to focusing a reflex camera, either of the single or twin-lens type, you can usually see just what you're getting on the ground glass viewing screen of the camera. But, what happens when you're shooting in the dark and your subject isn't lit brightly enough to be visible in any detail on the ground glass screen?

You generally run into this problem when using flash in dimly lit places. The image is so weak that you can't possibly see whether the outline of the principal object in the scene is sharply focused or not. Often, you guess that the focus is sharp and find that you have a fuzzy negative when the processing job is done.

The problem is solved very handily by any

FIG. 2 (*below*): The searchlight employed in Figure 1. The "X" is painted on the front glass with black India ink.

FIG. 3 (*below*): Penlight projection focusing adapter made of a penlight, cardboard, and celluloid marked with an "X".

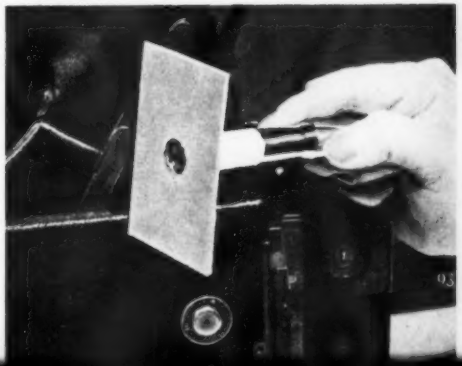


FIG. 4 (*right*): The penlight projection focusing adapter is placed on the camera screen and the light switched on.

of the simple gadgets illustrated here and described below. The idea is to convert your reflex camera into a projector by providing the ground glass screen with a focusing target and backing it up with a light source that will project it through the camera lens. Focusing is then done in reverse by projecting an image from the ground glass to the main surface of the subject and then adjusting the camera lens so that the projected mark will be as sharp as possible. When this has been done, a picture made of the subject from the position of the camera will be critically focused.

The simplest method of projection focusing your reflex camera is shown in Figure 1. The device consists of an ordinary searchlight with an "X" marked on its flat glass lens. By placing this down on the ground glass screen of your camera (diagram, page 93) so that the "X" is flush against the screen, you can project the "X" through the camera lens by switching on the searchlight. You now select the subject matter on which you wish to focus the camera. You have but to project your "X" on it and bring the "X" into sharp focus by properly adjusting the lens.

Figures 3 and 4 show another projection focusing adapter that can be made with a small penlight. You can make this in a few minutes by cutting [*Continued on page* 165]

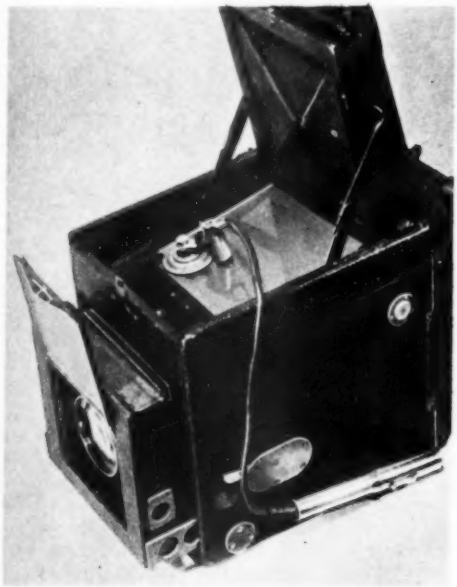


FIG. 5 (*left*): Projection focusing device consisting of a suction cup, a penlight bulb socket, marked celluloid, and a penlight battery case clamped to the camera.

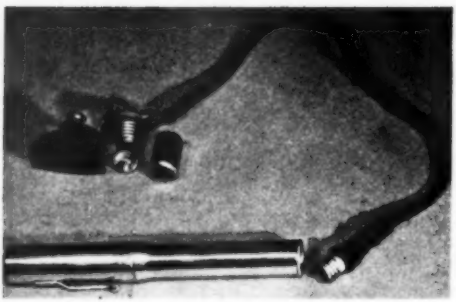


FIG. 6 (*left*): The parts of the suction-cup projection focusing device, disassembled.

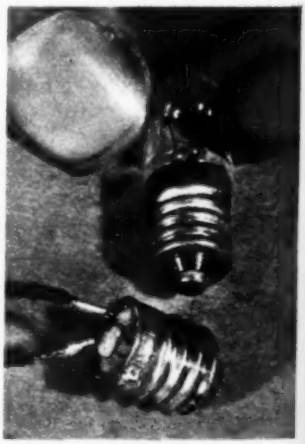


FIG. 7 (*right*): A broken penlight bulb forms a plug-in connection to the penlight battery case. Wires are soldered to inner leads as shown.

PHOTO CONTEST

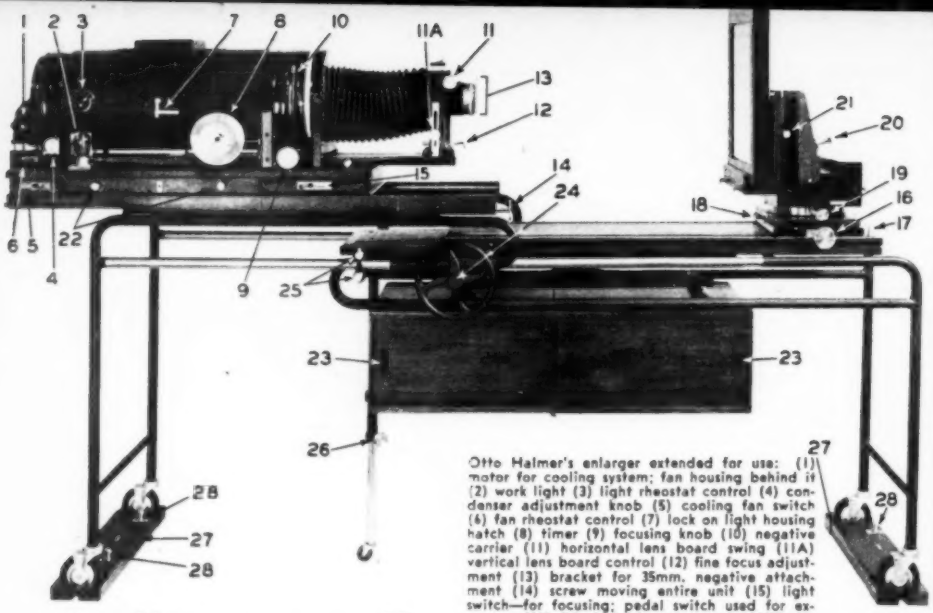
FIRST PRIZE ($10.00): "School Days" by Ed Arnold, 9 Winchester Place, Burlingame, Calif. **SECOND PRIZE ($5.00):** "At the Fair" by Percy S. Shore, 632-20 Street, W., Saskatoon, Saskatchewan, Can.; taken with a 620 Kodak Monitor, on Super XX film, in D-76; f/8, 1/400th second, with a K2 yellow filter. **THIRD PRIZE ($4.00):** "Mechanic's Manicure" by Irv Sauer, 2623 So. Drake Avenue, Chicago, Ill. **FOURTH PRIZE ($3.00):** "Proceed With Caution" by George L. Bewley, 3847 Elsinore Street, Philadelphia, Pa.; taken with a Rolleicord on Superpan Supreme film, in DK-20; f/5.6, 1/25th second—2 No. 1 photoflood lamps.

Submit prints for this monthly contest unmounted—no larger than 8x10 inches. With each print, list your camera, film, lens opening and shutter speed, illumination, and developer. Write your full NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. If you want unused prints returned, you must enclose return postage. (Published prints can not be returned.) Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

1st PRIZE

2nd PRIZE

3rd PRIZE



Otto Halmer's enlarger extended for use: (1) motor for cooling system; fan housing behind it (2) work light (3) light rheostat control (4) condenser adjustment knob (5) cooling fan switch (6) fan rheostat control (7) lock on light housing hatch (8) timer (9) focusing knob (10) negative carrier (11) horizontal lens board swing (11A) vertical lens board control (12) fine focus adjustment (13) bracket for 35mm. negative attachment (14) screw moving entire unit (15) light switch—for focusing; pedal switch used for exposure (16) 2-inch knob moves easel (17) set screw for easel (18) moves easel at right angles to base (19) turns easel through 360° of arc (20) controls forward-backward tilt (21) tilting set screw (22) small gadget drawer (23) large extra drawers (24) wheel extends base frame (25) fibre rollers carry unit's weight (26) adjustment on fifth leg (27) foot blocks keep base from rolling (28) locks wheels.

A "$2,000" ENLARGER

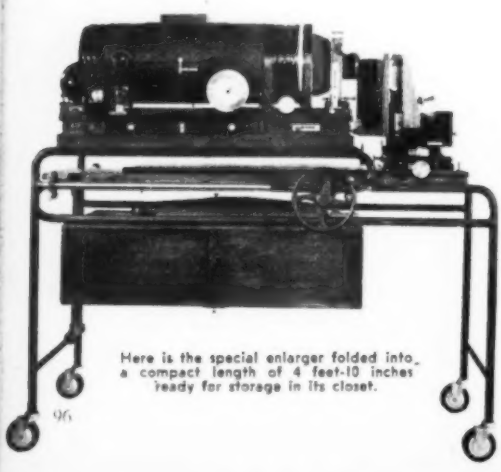
by Hoyt Barnett

MANY of us who must use a camera as part of a home-made projection printer feel we are doing better than all right when we get an image on our printing easel that will make an even print. Sometimes, we envy those with factory-built printing cameras having four or five adjustments to facilitate the task of cropping and composing.

But Otto Halmer of Los Angeles proved we need not envy our more affluent friends if we have a knack with tools and enough patience to build with care. He has a home-made enlarger that really is an enlarger. It compares with store-bought equipment as a custom-built yacht resembles a rush-job merchant vessel.

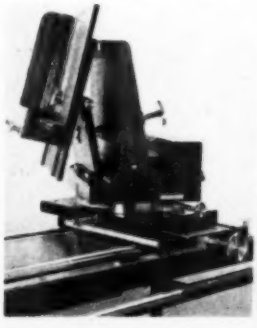
Without casting aspersions at the fine jobs turned out by the most painstaking commercial manufacturers, the Halmer home-built projection camera is a museum piece of precision hand workmanship and adaptability to the various problems of print making.

Each of its many [*Continued on page* 166]

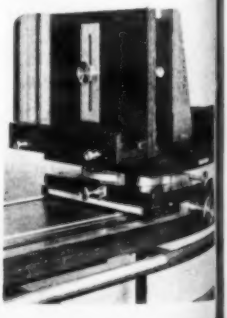


Here is the special enlarger folded into a compact length of 4 feet-10 inches ready for storage in its closet.

Here is a close-up of the easel of the enlarger showing how it can be rotated as well as tilted.



The special enlarging easel in its normal position; it holds a frame.



FREE-LANCE SALES

will pay your way

by John D. Tisket

ALL amateur photographers sell some prints in the course of their experience, but most are satisfied with too little for their work. This means that new equipment is dreamed of, instead of obtained.

It matters little whether you live in a small town or in a large city; you can sell enough pictures to cover the cost of your hobby and buy new equipment besides, if you do your selling with that end in view. As a matter of fact, the smaller towns are best for the amateur. Competition is not as keen, and the desire for pictures is greater because there are few other diverting interests.

The number of picture-sales possibilities in any town, city, or community are almost unlimited. Pets, parades, weddings, reunions, picnics, children, old folks, attractive gardens, are some of the countless personal things in which people are interested. Old and young cherish pictures of themselves or their relatives enjoying themselves, or engaged in their hobbies or any other pursuits of which they are proud.

Men, particularly, will buy photographs of their achievements in business or profession. For example, the small town merchant is proud of his new show case or window display or new truck. They show what a prosperous and progressive fellow he is. The architect is proud of the beautiful buildings and homes he designs. He sees to it that a bronze marker inscribed with his name is prominently placed on the bridges and public buildings he designs. Besides, it's good business.

The contractor, who struggles with the rough, clumsy materials of nature, and fashions them according to the architect's vision, is also proud of his skill. His name goes on the bronze plaque, too. And that is good business.

It is also good business for architect and contractor to buy your pictures of their achievements—a fact which they know, apparently, much better than the amateur photographer does. It would cost an architect or a contractor or a manufacturer of machinery or a maker of any other large product, considerable money and time to

Above: "It's an ill wind . . .". A series of good wreck or accident pictures will net enough to buy you anything from a new tripod to a new camera—if properly priced.

Right: Cash in on local fashion shows, selling photographs to the sponsors of the apparel items as well as the models. If they like them, they will both pay well.

Below: Local disasters like floods and fires are bound to offer many sales opportunities. Newspapers and private individuals, especially property owners, will be interested.

Above, left: This is the type of disaster photograph that will have more than local interest. It will be of considerable advantage to authorities planning preventive measures for the future. *Above:* "Mr. Merchant's" new, refrigerated show-case costs him the price of a new automobile and he's extremely proud of it; besides, it is an appetizing business promoter. If you, as a free-lance, make a photograph of the equipment that enhances the store, it will be of value to "Mr. Merchant" and he will gladly pay well for it.

tour prospective customers over the countryside to show and sell them his products. Photographs furnish the answer—your photographs, if you will.

Compared with the profit on a new bridge, a three-story building, five miles of three-lane highway or some new canning machinery, how much does the cost of a half dozen 8 x 10's amount to? Practically nothing!

But, selling prints and making a profit on them are two different things. When you sell prints you are placing yourself in competition with local professional photographers whose living depends upon selling pictures at a profit. It is neither fair to yourself nor to them to part with your work at a ruinous price, just because you do not depend upon selling pictures for a living, or because you enjoy making them. Is it any wonder we amateurs are faced with licensing legislation?

When a print compares favorably with professional work and its worth to the buyer is many times over the price asked, why should an amateur sell it for a fraction of what its preparation costs him, when he can easily make a decent profit on the sale?

Have you any idea, for instance, what it costs you in time and material to make a print? Have you sold many pictures? Do you know anything about local professional prices—what professionals are getting for their work in your town? Can you say "no" when a prospective buyer tries to chisel your price down? If you are selling a few prints but do not seem to get any of the new things you need and want, the answer may lie in the answers to those questions.

An amateur photographer may think he can make an 8 x 10 print cheaper than a professional photographer can, and for that reason feel that he should sell it cheaper. Whether he

Below: Make some Kodachromes or handsome black and white enlargements of Oscar, the neighborhood "Bluebeard." His mistress would never think of taking him to the studio but she won't be able to resist a batch of expressive shots of him—if your price is right (and make sure it's fair to you, too). *Bottom:* Hobbyists, reunionists, and conventionists—all like to have photographs of their handiwork, activities and fellow enthusiasts. Just be sure everything is "clear."

Above: Progress photographs and before-and-after comparison shots find a ready market among builders and contractors. You'll generally find that contractors never quibble about price, but you'd better not profiteer if you want to sell him pictures of his "next" job. He knows values by the very nature of his work and he's willing to pay a top price if you can supply him what he wants for his record purposes. *Above, right:* Officers, members and quarters of civic and fraternal clubs make saleable subjects.

Below: Candid photographs of children at play or in characteristic moods are preferred by many parents to stiffly posed portraits in the commercial studio. This is the basis of the home portraiture business into which many professional photographers branch, as a full or part-time proposition. This type of work is on the borderline that separates the free-lance from the professional. Your work has to be competent, up to professional standards, before you can compete and earn the price the effort is worth.

can do this is questionable, and even if he can, he should not sell it very much cheaper than the professional would.

He considers that his overhead is less because he has no studio or darkroom rent or other expenses to pay, and besides, he uses a small camera and his films are cheaper. What he does not consider, however, is that his waste is hundreds of times greater than the professional's and that he buys his materials in small quantities and pays top price, whereas the professional buys in larger quantities and gets all manner of discounts. Further, the professional has figured out what it costs him to make pictures. He knows what he has to charge to come out with a profit over a period of time. The amateur does not.

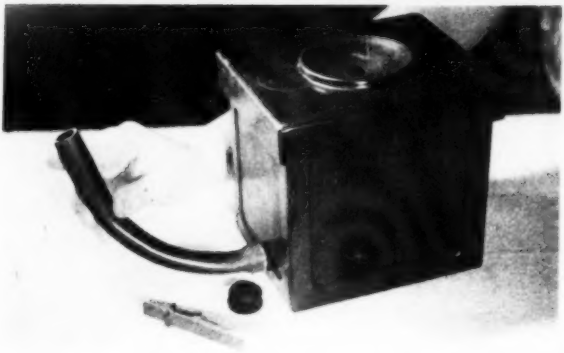
You cannot bring down the professional's price on a set of pictures any more than you can chisel the grocer on the price of a loaf of bread or a lawyer on his fee for getting you a divorce. But an amateur photographer will allow himself to be chiseled all over the place. He won't know whether he's making any money or not, and he won't care. He had his fun making the pictures, and he's tickled to death to tell his fellow amateurs that he "sold" some pictures!

New equipment, supplies and gadgets cannot be bought with fun. Your dealer likes the photographic supply business, but you must pay him cold cash and a profit if you want what he has. You can't bargain with him! It is the amateur's fault that people place so little value on his work.

Do a good job, charge a fair price, and you will find yourself with far more orders than if you do sloppy work and take for it whatever is offered. Further, you will see your work improve and the quantity of your equipment increase.

KINKS

Above: An easily-applied protective coating for bottle labels can be made of clear cellophane scotch tape. Apply it in horizontal strips from the bottom up in the manner of roof shingles, as shown. *Maxwell Cotton.*

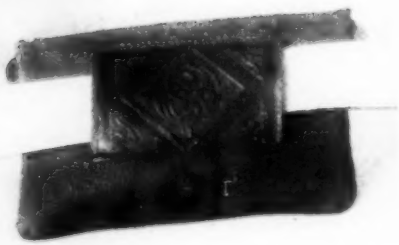


Above: Large cut film tanks which have a screw-cap outlet at the bottom are often difficult to handle—the solution leaks out of the opening before the cap is unscrewed completely, giving rise to waste. This can be remedied by substituting a short length of rubber hose for the screw cap and keeping its end shut off with a wooden clamp. It is only necessary to release the latter to get an even flow of solution. *Louis Hochman.*

Above: To avoid the annoyance of keeping the surface of the "top" print submerged in the hypo bath between agitations, place a sponge-rubber ball with a dowel pushed into it on top of the print stack. *William Swallow.*

ACCESSORY POUCH: The accessory bag worn on the belt of the photographer in the above illustration was converted for camera use from an old tobacco pouch. The leather article was purchased for 60 cents, and an extra piece of leather was sewed on to its back by a local cobbler—to accommodate the photographer's belt, which slips through it *(right)*. It contains a lens shade, filters, and a few extra rolls of 35mm film. *Victor Ciomei.*

Above: When tinting a photograph with oil colors, metal articles may be given a finish of the proper color and lustre, too. To make the metal "tinting" substance, place a little oil color medium on a glass plate and mix in a minute quantity of silver or gold bronze powder. Apply it to the print sparingly with the point of a toothpick. Let the work dry before handling it. *Kenneth Murray.*



LILLIPUPPETS

Part 2

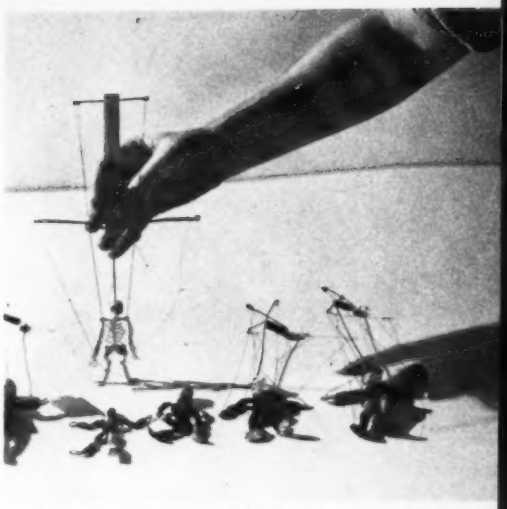
If you've completed some of the puppets described in last month's MI, you'll want to bring them to "life." Here's how.

by Leslie P. Guest

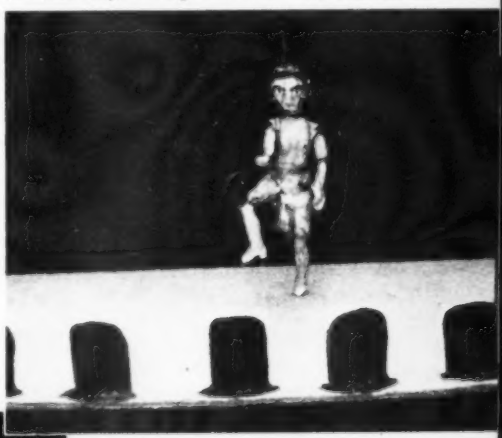
NOW we come to the stringing of the Lillipuppets. Cut a number of lengths of black cotton thread, about 12" long and make a knot in one end of each piece. Threads are to be fastened to each hand, to each upper leg just above the knee, and to the center of the back just below the shoulders.

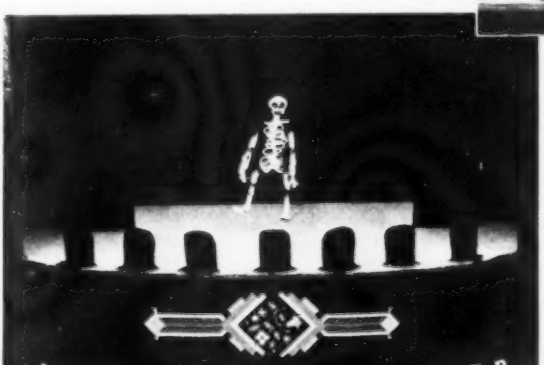
With a sharp needle make a hole in the figure at each of these points. Use the blunt end of the needle to force a knotted end of thread into each of these holes. Now place a tiny drop of glue, preferably transparent cement, over each hole and work some of it in along with the thread, using a pin or needle. When the cement sets you will find that the threads are firmly attached to the Lillipuppet and that they will break before they will pull out of the holes. Threads are linty and apt to cling to each other. To prevent this, apply a little paste floor wax to your fingers, then run the threads between them. Threads so treated will last a long time and will not catch over each other.

Attach the knee strings to the loops at the ends of the controller bar. Adjust these carefully so that there is no tension and the legs will hang straight. However, they should be so nearly taut that rocking the long coil of the controller bar will lift either foot in turn. The hand strings can be one continuous string running loosely through the front loop of the controller. Again, the hands should rest freely at the sides, but a slight pressure on the strings should raise either or both hands as. [*Continued on page* 134]



Mr. Skeleton's controls are a slight variation on those of the more conventional puppets. Raising the ring on the operator's little finger will cause Skel's head to fly off up the wire projecting from his skull. Lowering the cross wire at the top of the stick drops his legs and arms eerily from his torso.





Left: The Fugitive From a Ration Card goes through his paces. Hula girl above may not be beautiful, but she's well fed and does her stuff convincingly.

Tools in Action!

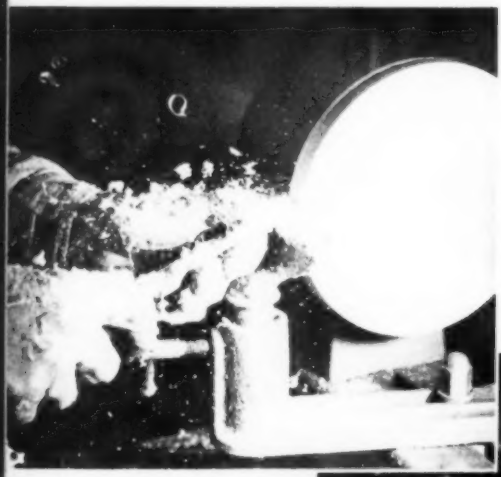
Secrets of home workshop equipment revealed by the high speed eye of the camera.

by Walter E. Burton

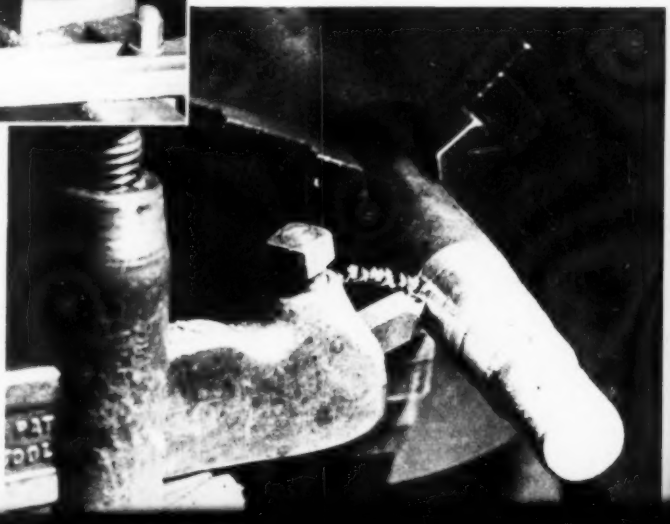
Like a thousand tiny tracer bullets the spark-paths of mild steel are recorded on film with the aid of a Kodatron Speedlamp. Note that nut on shaft of grinding wheel has been stopped by camera, though wheel was turning at high speed.

WHAT happens when your drill bites into a piece of metal or wood? When you hold a chisel against the grinding wheel, or a dirty piston against the wire wheel? What actually takes place as your lathe tool presses on the turning? Every mechanic knows the results of these operations—material is removed from the work (See *What Is a Machine Tool?* June, 1942 MECHANIX ILLUSTRATED)—but the process itself is a mystery forever hidden from the human eye by a veil of high r.p.m.'s. The mechanics can never see exactly what occurs as the lathe bit peels off chips, but a camera, aided by proper illumination, can.

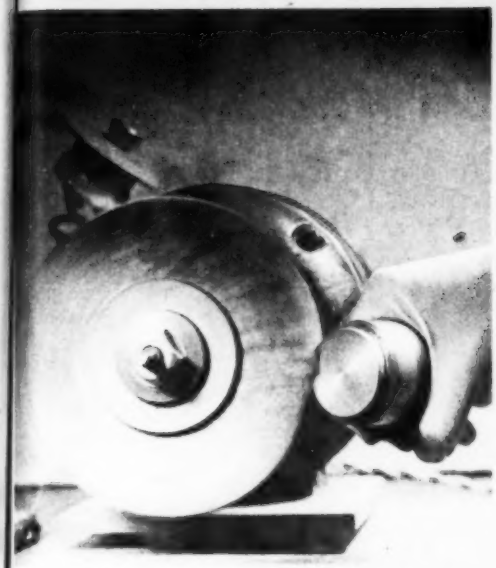
With the aid of high speed synchronizers and photoflash lamps, and electrical-discharge lamps of still greater speed, new facts are being learned about the behavior of shop machine tools and other moving mechanical parts. With war production approaching top efficiency, this research assumes a new importance in many ways—for instance, if we can discover why a certain cutting tool used in an arms plant has to be replaced more often than it should, we've helped open up a bottleneck. A few high speed photographic studies of the machine in question may well disclose the seat of the trouble in jig time, making



Above: Turning down the edge of a white pine disk on a lathe. Longer chips leap higher into the air than their stubbier brethren.



Right: Lathe bit peeling a chip off a length of cold rolled steel. Since rotational speed here is not as great as that encountered in most other shop operations, lathe bit action is relatively easy to "freeze." However, movement of the chip is often very rapid.

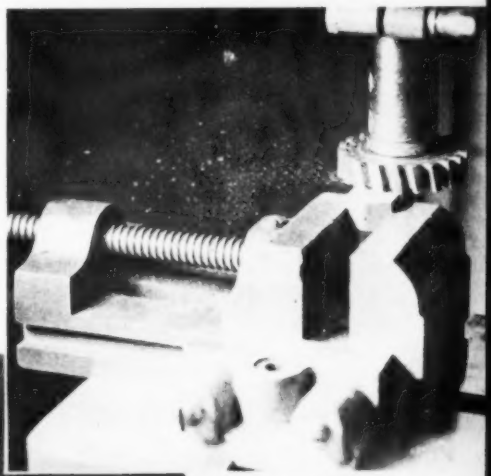


A metal-spinning die is cleaned with a buffing brush, and provides an interesting subject. Note how bristles snap away from work, move faster than the speed of rotation, and again strike the work almost end-first. Speed of brush, 1,750 r.p.m.

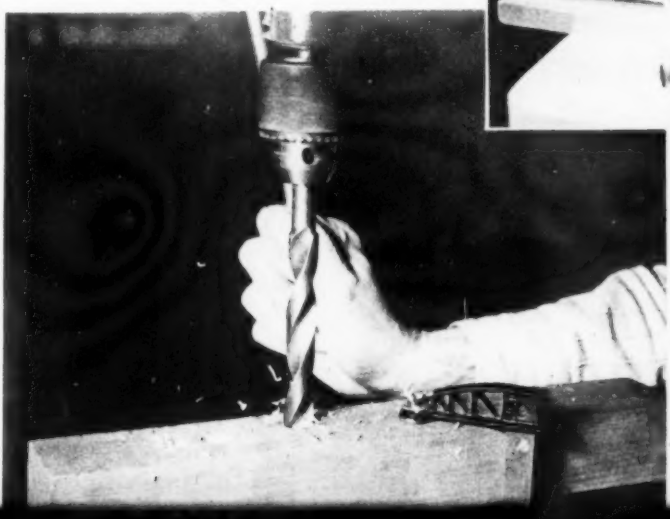
Kodatron shot of a portable circular saw ripping through a board. Saw blade has been stopped almost dead by flash, as evidenced by lettering in light area. Sawdust movement shows why operator would be wise to wear a gauze mask.

rapid analysis and correction of the fault possible.

Many amateur photographers already possess equipment capable of stopping many normal shop actions such as the movement of a drill bit or work in a lathe. Shutter speeds of 1/1,000 second or greater are required. A properly-adjusted synchronizer is necessary for flash-lamp shots; and the lamp reflector should be designed to give a moderately-wide, even beam of light. Since the lamp usually can be placed within 16 inches or so of the subject, small bulbs [*Continued on page* 171]



Above: Milling cutter mounted in drill press working on brass at 750 r.p.m. Action of cutter teeth is stopped, but powdery chips, moving at greater velocity, appear somewhat elongated.



Left: Boring through a piece of cypress with a spur bit. Note how slow-moving chips are stopped dead in mid-air. Oval shape of hole in chuck is caused by motion of the focal plane shutter's slit.

BIKE TURN SIGNAL

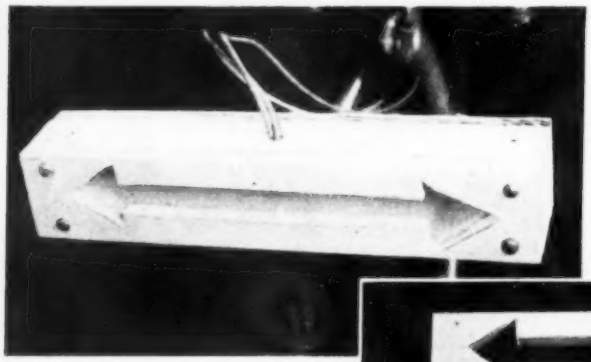
by Brock Yates

NOW that bike travel looms up as being something more than a mere diversion or sport, we shall want to be keeping the "old crate" in repair and perhaps we might even be convinced that a home-made accessory or two would add to convenience and safety.

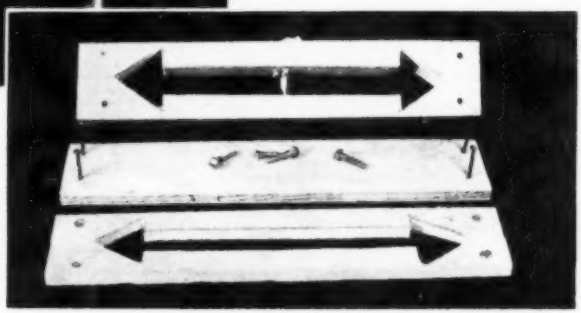
It can certainly be said that a turning signal would be of great value and, what is more, it is to be expected that a mechanically inclined young man can have a lot of fun making such a thing, especially in view of the simplicity of the device, the low-cost and easily-available list of materials that enter into its construction. The electrical materials may be had at the chain stores and the remainder merely amounts to odds and ends in wood and metal that may be found in any home.

Like good mechanics, we study our blueprints or plans before any action of any kind is taken. It is imperative that any mechanism is thoroughly understood before construction is begun.

We note from our drawings and photos that we have a wooden case with a two-way arrow cut in it, four 1½ volt flashlight bulbs to illuminate one half of the arrow at a time (only two lights operate at a time), and two tiny switches.



Top: Traffic hazards are reduced by means of this arrow signal—a squeeze of the rider's hand flashes the direction of his turn to anyone behind him. *Above:* the indicator can be mounted on luggage carrier or fender.

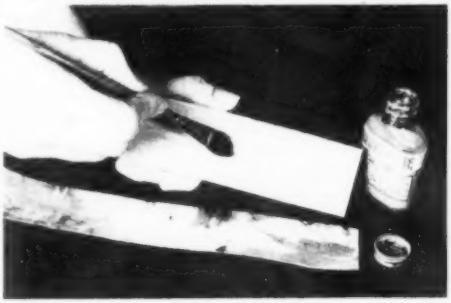


Right: The simple component parts of the indicator signal. Use only outdoor plywood for the backing piece, and paint each section thoroughly before assembly—and before installing the celluloid window.

The window is sandpapered to diffuse light and hold stain.

Above: One of the two switches mounted on the handlebars. Drawing below gives building details, and wiring diagram.

Below: Metal foil reflecting panel is glued to backing piece.



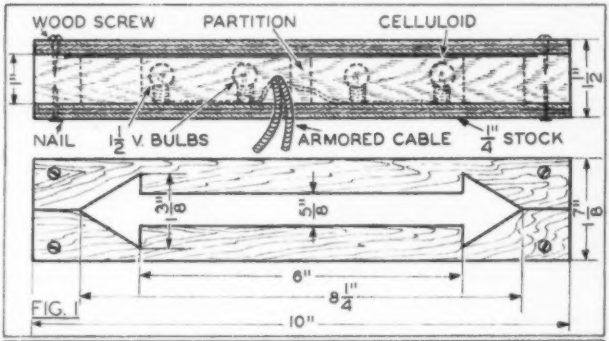
one on each handlebar.

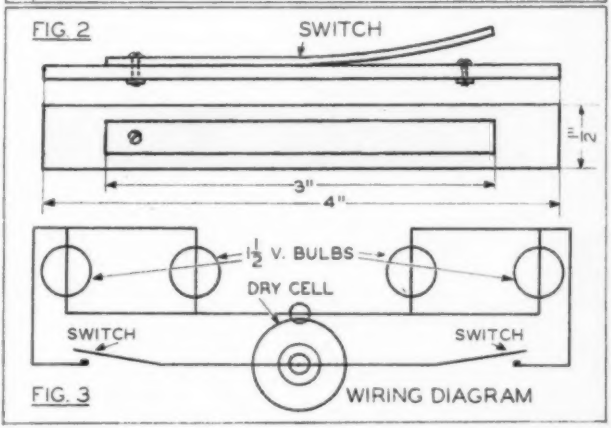
The case holding the bulbs is cut from 1" soft pine with ¼" plywood top and bottom. The top has an opening the same size and shape as the arrow in the body of the case. Sandwiched in between the case body and the top, we find a piece of celluloid of the sort that may be had at automobile accessory shops. Glass may be used but it is apt to break when the top screws are tightened, and unless red glass is obtainable will be far more difficult to color than the celluloid. With the latter, one simply sandpapers the surface and thereafter applies several coats of ordinary red ink, permitting each successive coat to dry until the proper depth of color is achieved. It will also be found that the sandpapering provides a frosted effect and at the same time permits the passage of a large amount of light. The inked side is mounted face in.

The double-ended arrows are cut in the wooden pieces, that is, the case and the top member, either with a hand or power jig saw.

Before the bottom member is finally nailed into place, the builder should cement or glue a piece of aluminum foil over it. This helps to reflect the light outward, which is exactly what is needed for maximum visibility.

The 1½ volt bulbs are set in place before the top is screwed [*Continued on page* 167]

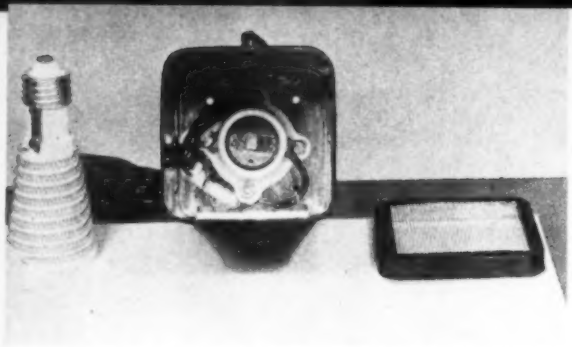




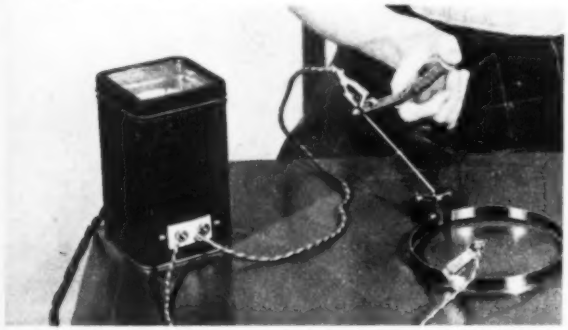
FIFTY-CENT

Every workshop should have this light duty welder.

by R. A. McKay



Above: Looking into the top of tin-can-housing. Bowl heater screws in.



Above: Feed wire may be clipped to curling iron as shown, if desired.

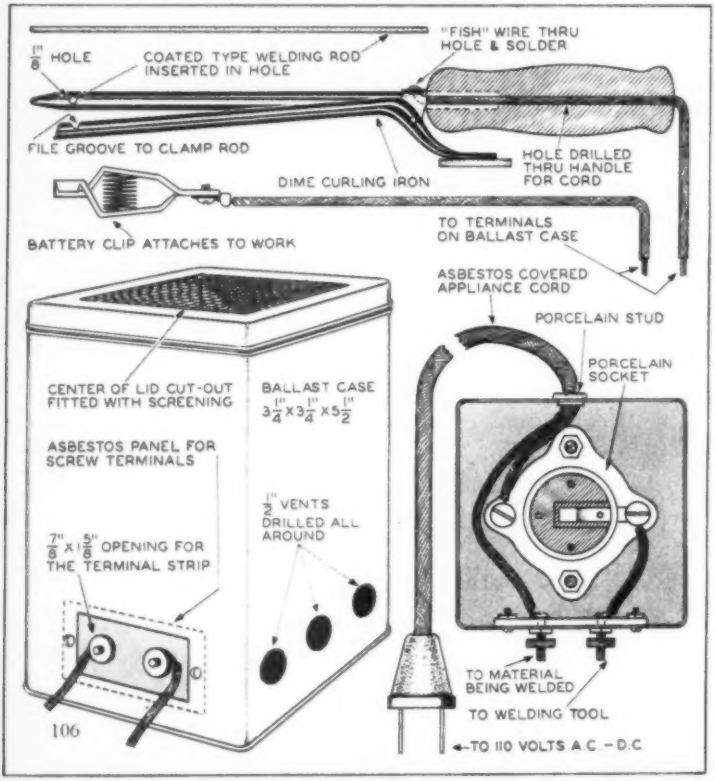
A LIGHT duty welding outfit is one of the most useful tools in the home workshop. With it you can fabricate light metal work, such as radio chassis, cabinets, and do a host of home, auto, and shop repairs.

This practical and professional-looking welding outfit cost just 45 cents to build. All materials, except for the metal box, came from the ten cent store. These items included a porcelain cleat type socket, bowl heater nichrome element, and a dime curling iron. The bill of materials was completed with a length of asbestos ironing cord, several feet of auto ignition wire and two battery clips.

The curling iron may seem out of place in a home workshop project, but noting the photos, you will see that it serves as ideal tongs for the welding rods. Unlike pincer type tongs, this one holds the rod in a vertical position where it cannot slide from side to side.

The welder operates on current from any 110 volt A.C. or D.C. supply, and produces a good, hot arc when standard $\frac{1}{16}$" or $\frac{1}{32}$" coated rods are used. The construction is so simple that not more than two hours will be required to put the welder together.

First of all, drill a $\frac{1}{8}$-inch hole through the curling iron about an


"FISH" WIRE THRU HOLE & SOLDER
1/8" HOLE
COATED TYPE WELDING ROD INSERTED IN HOLE
FILE GROOVE TO CLAMP ROD
HOLE DRILLED THRU HANDLE FOR CORD
DIME CURLING IRON
TO TERMINALS ON BALLAST CASE
BATTERY CLIP ATTACHES TO WORK
ASBESTOS COVERED APPLIANCE CORD
PORCELAIN STUD
PORCELAIN SOCKET
CENTER OF LID CUT-OUT FITTED WITH SCREENING
BALLAST CASE 3 1/4" X 3 1/4" X 5 1/2"
ASBESTOS PANEL FOR SCREW TERMINALS
1/4" VENTS DRILLED ALL AROUND
7/8" X 1 5/8" OPENING FOR THE TERMINAL STRIP
TO MATERIAL BEING WELDED
TO WELDING TOOL
←TO 110 VOLTS A.C. – D.C.

Drawing shows all parts needed, and assembly details. Ballast case may vary from dimensions.

WELDING OUTFIT

inch from the tip. Opposite this hole, file a groove in the thumb-operated crimper so that when a length of welding rod is inserted in the hole, the spring tension on the crimper holds the material rigid.

A hole is now drilled through the handle of the curling iron, large enough to take a length of auto ignition cable. Following this, another hole is drilled in the curling iron opposite the thumb button that opens and closes the crimper. Make this hole ⅛" or $\frac{3}{16}$" so that the ignition cord can be pushed through the handle and the bare end fished through the opening. This done, solder the protruding ignition wire to the metal with a lusty drop of solder.

Now that the tongs are completed, the final stage is to assemble the voltage ballast unit. This consists of a metal container 3¼ by 3¼ by 5½ inches high. A humidor in which cigars were packed was used here, but any tin can with a friction lid will serve the purpose; exact dimensions aren't important. One inch from the bottom of the can, draw a center line on all four sides. On the front, cut a ⅞" by 1⅝" opening for the terminal strip. Then on the remaining three sides drill ½-inch vent holes as shown.

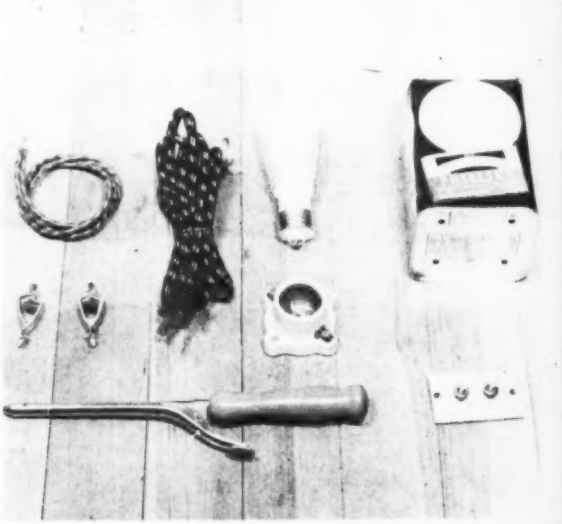
In order to obtain a maximum displacement of heat, the center of the lid was cut out and fitted with copper mesh. It was later found that a dozen or so ½-inch holes will prove just as efficient. The latter method, too, is somewhat easier when a drill press is available.

The final stage of construction is to wire up the socket for the ballast unit which is mounted within the can. Two machine bolts mounted through the bottom hold it in place. The center hole in the back of the can is enlarged to take a porcelain stud insulator through which a length of asbestos ironing cord is then inserted.

One lead of the ironing cord is connected to a terminal on the socket. The other wire from the cord is connected to one of the terminals on the small asbestos panel mounted on the front side of the metal container. Wiring is completed by [*Continued on page* 171]

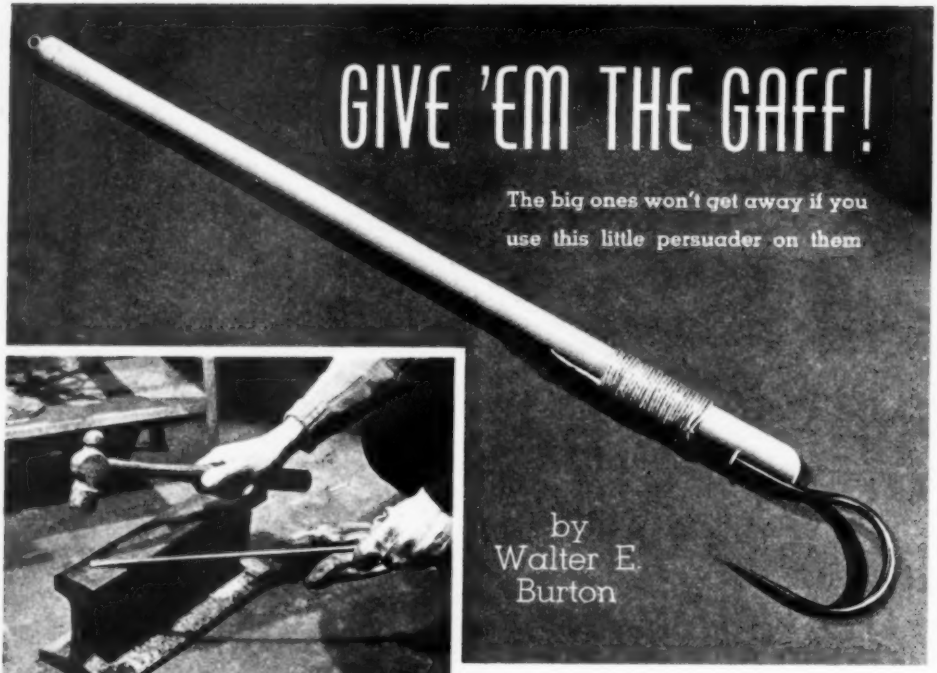
Young lady above is ready to begin welding job, with apparatus correctly arranged. Be sure wire is securely clipped to clean part of work.

Simple and inexpensive parts shown below make the fifty-cent welder. Tin can may be any friction top type approximately the size shown.



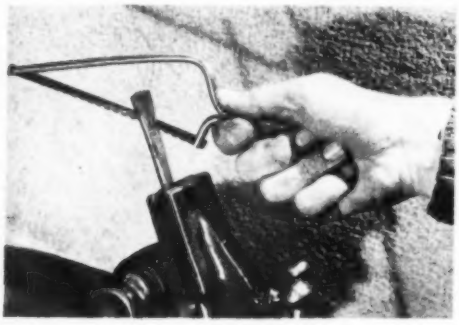
GIVE 'EM THE GAFF!

The big ones won't get away if you use this little persuader on them

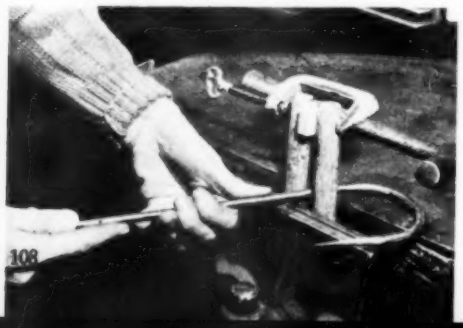


by Walter E. Burton

Heated end of steel rod is flattened to form the point.



Above: Sawing away excess metal at the point. *Below:* The hook is bent by inserting it between two pieces of pipe in vise.



A GAFF hook for landing large fish is not difficult to make: anyone who can heat an iron rod red-hot can do it. The hook illustrated was fashioned with ordinary tools from a 22-in. length of $\frac{5}{16}$-in. steel rod found in a junk pile. It is shaped somewhat like the handle of a shepherd's staff, and has a right-angled spur at the end of the shank, for driving into the handle.

In duplicating this hook, the dimensions given in the drawing will serve as a guide. You may vary them somewhat, for they are not critical. Get a length of cold-rolled steel or similar rod, and if necessary clean it up with a piece of abrasive cloth or sandpaper. Form the point first. Heat one end in a gas flame or bed of coals until it is a bright red, then hammer it until it is flattened somewhat like the end of a cold chisel. Let the metal cool, and with a hacksaw cut away the two edges of the flattened area to form a square point. Reheat and forge the point into a round cross section. Any irregularities can be cleaned up later with a flat file.

Next bend the rod to form the hook. You can bend it cold or hot; but before cold-bending, heat the metal to a bright red for a distance of about 10 inches from the pointed end and let it cool. This anneals it. In a

Shaping off the spur at the end of the shank with a file.

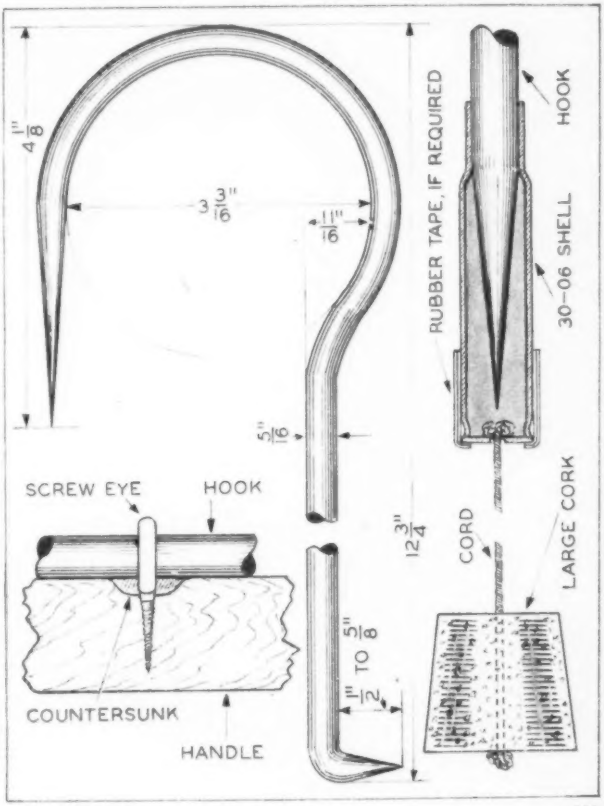
Shank is run through a screweye and spur driven into handle.

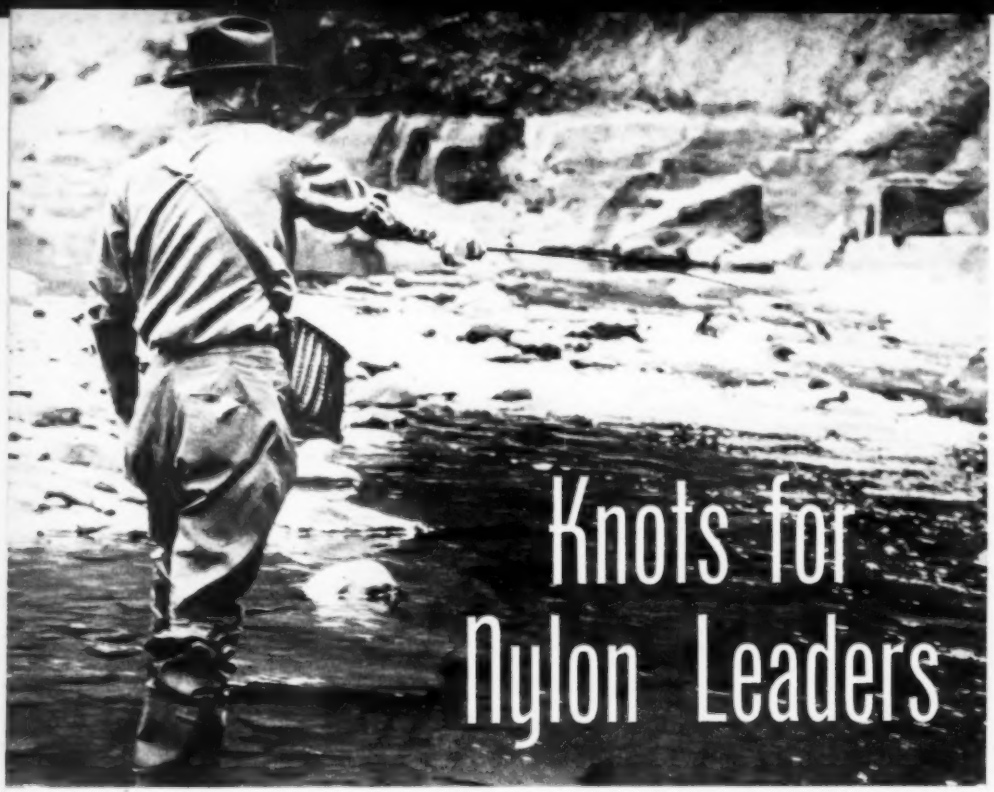
bench vise, clamp two parallel pieces of pipe or solid rod ½ inch or larger in diameter, to form a bending tool. The space between the pieces should be about ½ inch. If you have no vise, bore two holes in a log or heavy timber to receive the pieces. Insert the pointed end of the rod between them, and bend the hook to shape. You will find that this is almost surprisingly easy. One of the photos shows the reverse bend, near the base of the hook, being made with the device.

Cut off the shank until the overall length of the hook is about 13½ inches. Heat the shank end red-hot, flatten it for a distance of about 1¼ inches, and bend about ¾ inch of it at right angles, in a direction opposite the bend of the hook. Cut off excess metal to form a pointed spur, and sharpen it with a file or grinding wheel.

After the hook is the shape desired, and the point and spur touched up to your taste, heat all the hook but about 7 inches of the shank to a bright cherry red in daylight, and plunge it into a bucket of cold water. This hardens the steel. Polish a spot on the hook until it is bright, and heat again until this polished spot turns a dark purple. Then plunge the hook again into cold water. This tempers the steel. Some people prefer a mixture of 1½ pints linseed oil and ½ pint engine oil for the final, or tempering bath.

The handle shown was made from an old broom handle and is 30 inches long. You may prefer to make a lighter handle of bamboo. Round the hook end with a rasp so it presents no angular projections. About 2 inches from this end, drill a hole and insert a screweye that will slide snugly over the shank of the hook. Turn the screweye part-way down, insert the hook as far as desired, and mark the point where the spur touches. Remove the hook, drill a hole to receive the spur tightly, and turn the screweye down until the inside surface of the eye is flush with the surface of the handle, as shown in the [*Continued on page* 173]



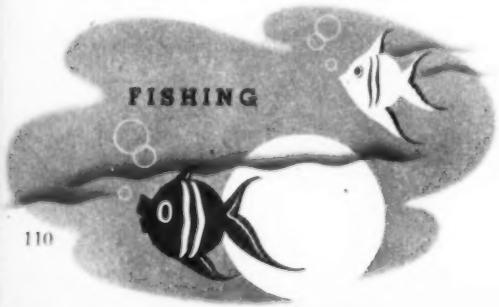


Knots for Nylon Leaders

by Walter E. Burton

NYLON leader material has won approval of fishermen because of a number of points of superiority claimed over various forms of gut that have been in use. Some fishermen, however, have complained of difficulty with knots that slipped.

The age-old art of tying knots was therefore made a subject of scientific study in the Plastics Research Laboratories of the E. I. du Pont de Nemours & Co., at Arlington, N. J. It was found that leader breakage and knot slipping result from either the use of improper knots or from hastily-tied ones. The research showed just which knots are most satisfactory, which are unsuitable.



Many fishermen will not need to re-learn the art of knot tying when using Nylon leaders, for most of the knots commonly tied in gut leader will hold in Nylon. Exceptions are knots of the "jam" variety in which the leader exerts friction mainly against some material other than itself.

You can purchase Nylon leader material at any well-stocked sporting-goods store. A considerable number of manufacturers market such leaders under various trade names. Continuous lengths of the leader material, from 10 yards up, and in strength from 6 to 20 pounds, are available.

The knots illustrated by the accompanying photographs and drawings have been found suitable for use when tying Nylon leaders. In all cases, you should become thoroughly familiar with the method of tying the knot, and then take time to do the job right. Haste and carelessness will result in trouble, and more than likely in the loss of a finny prize or two, to say nothing of scuttled lures.

TURLE KNOT (For wet or dry flies) is

a well-known and easily-tied knot suitable for Nylon leader.

Photo 1. Pass the leader through the hook eye and tie a running or slip knot in the end. The fly should hang with the hook toward the knot when the leader is horizontal, as illustrated.

Photo 2. Bring the loop back and around the body of the fly.

Photo 3. Continue until the loop encircles the neck of the fly. Hold it there, and make the loop smaller by pulling the leader.

Photo 4. When the knot is tight around the fly's neck, it has the appearance shown.

(Note: For clarity, a bare hook was used in *No. 4;* and also for clarity, the leader in this series is larger than that normally employed.)

The strongest knot for holding a hook used in bait fishing was found to be the DOUBLE EYE KNOT illustrated in photos. It is extremely easy to tie.

1. On the end of the leader, tie a single-running or "slip" knot, and run the loop through the hook eye as shown.

2. Pass the loop around the hook and pull it back toward the eye.

3. Stick the free end of the leader through the loop in the manner illustrated.

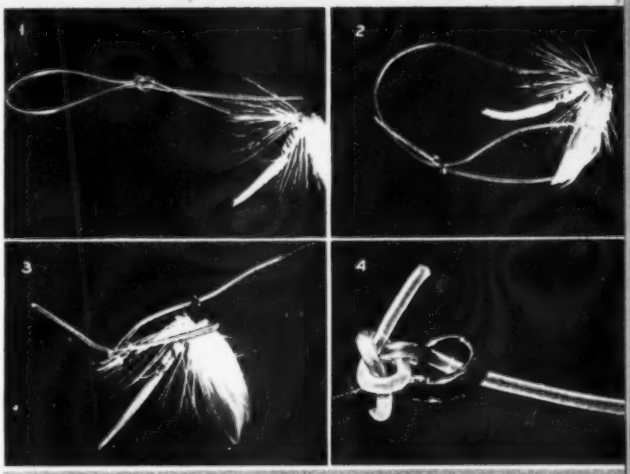
4. Pull the leader to tighten the knot, and the hook is firmly secured. Trim off the short end if it is too long.

The LARK'S HEAD KNOT is one of the simplest leader knots, and is used for tying leader material to ringed hooks and swivels.

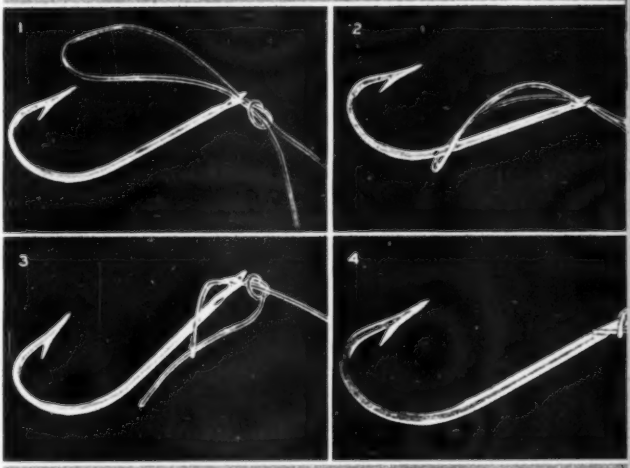
1. Make a secure loop in the end of the leader, as shown. Pass it through the ring and over the hook or swivel, and pull it back toward the ring.

2. Spread the end of the loop out until it will slip around the ring and take the position shown. The following knots are illustrated by drawings:

A knot [*Continued on page* 138]

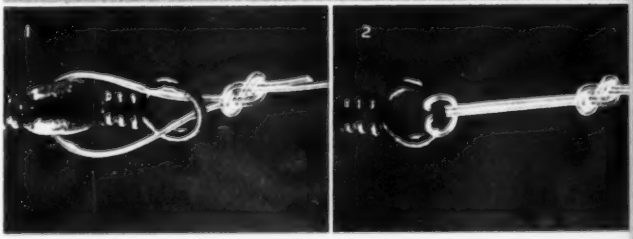


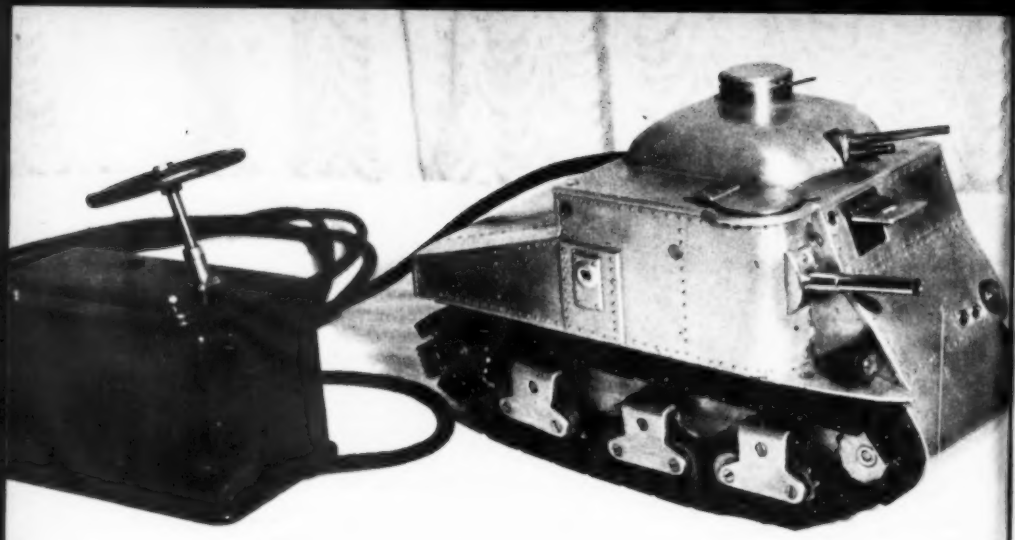
The TUBLE KNOT. Photos above show four steps in making this widely-used knot, particularly adaptable to Nylon leaders.



Above: DOUBLE EYE KNOT for bait hooks. This knot has great strength.

Below: Perhaps the easiest of all knots used in fishing is the LARK'S HEAD.

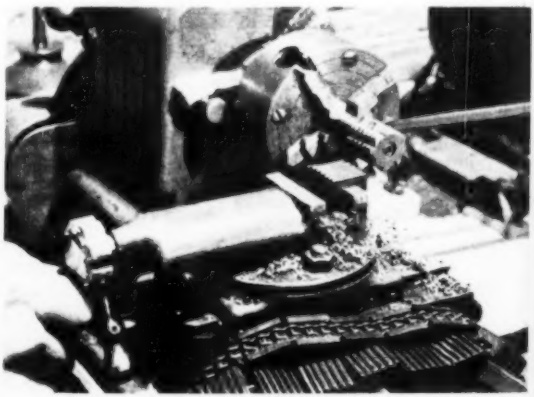




MODEL M-3 ARMY

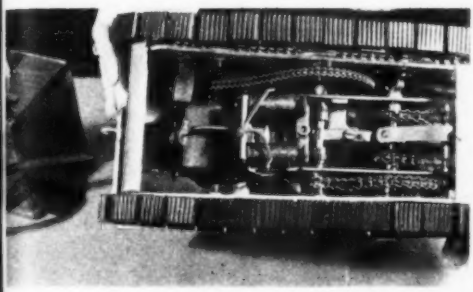
by Alfred Brosseau

FAR more than a mere toy, this little tank, designed and built in my spare moments, can perform realistically most of the maneuvers of which its big brother and prototype, the Army M-3, is capable. As it rolls along, the midget 75 mm. rapid-fire cannon in the right-hand turret spits wooden shells with considerable force at the rate of two per second, its firing controlled by a button on the remote switch box. Because of the model's astonishing performance and genuine appearance, it should prove of great interest not only to other model builders, who, like myself, want to keep abreast of the latest military equipment, but to schools, groups, or classes teaching the fundamentals of mechanized



Left: Smoothing off the turret trap door with a hand power tool. *Above:* Tread sections were grooved by being clamped in lathe tool post, run under a homemade multiple cutter. They are made of wood or bakelite.

Realism to the last detail is featured in this mechanized model of Uncle Sam's hard-hitting M-3 tank, another "first" for MI's model-building readers. The tank operates by remote control, utilizes inexpensive, easily-obtained parts.



Bottoms up! Electro magnets which operate clutch lever are fastened to bracket, which, in turn, is soldered to motor shell.

TANK

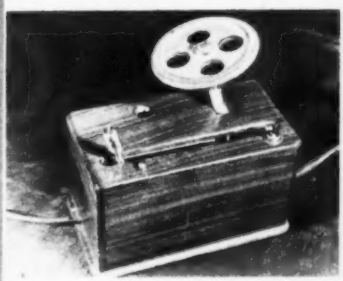
warfare. As an instructional project for shop or model students it is ideal, calling for near-precision, but not particularly difficult craftsmanship.

Only twelve inches long, by six wide, the baby M-3 has power enough to pull a wagon and three-year-old child. A rheostat in the control box permits a speed range from a slow crawl to a proportional equivalent of about 35 m.p.h. It will turn to right or left at a touch of the control wheel anywhere within a thirty foot circle. Motive power is supplied by an automobile defrosting fan costing a little over a dollar. Some of the sprockets and chains were acquired from an old piano, the rest homemade. An old electric bell provided the means of shifting the double-action clutch. The body was made of sheet metal ⅛" thick, to maintain the scale of the 1½" armor plate on the 28-ton real M-3. If no sheet metal is available to the prospective builder, he can substitute wood, as indicated in the plans.

The tank comprises two separate structural parts: the body and the chassis. The body also carries most of the details which make this model so very interesting. The chassis contains all the major working parts and is attached to the body at two points of suspension with the utmost simplicity.

The first step in making the body is to draw full-sized cardboard patterns from the plans, using these patterns to mark off the parts on metal or wood, whichever is employed.

Above: A battle scene staged in miniature with the M-3 tank and toy soldiers. *Below:* Control box with speed lever, steering wheel and gun and light switches.



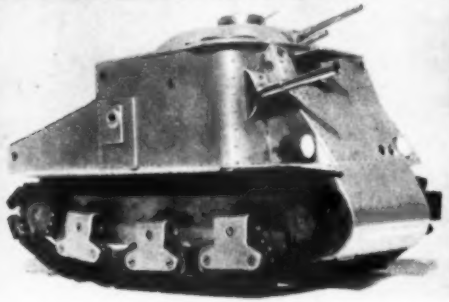
Below: Loading wooden shells into magazine.

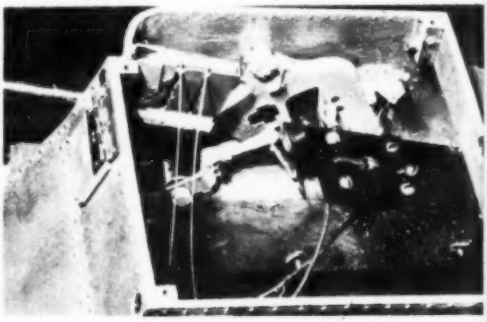
If metal is available it will be better to use it, as it is strong and lends itself to precision work. However, if metal sheet is hard to obtain there is no reason why plywood should not be substituted. A general idea of the plywood method of construction is given in one of the detail drawings.

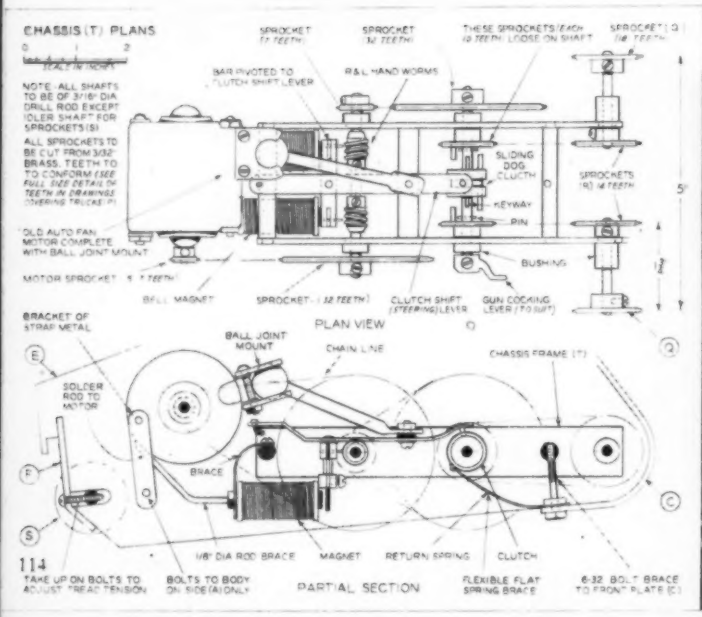
Take off full scale plans of all the body parts from the scaled plans given. Drill throughout for 6/32 machine screws, countersinking all holes for screw heads so that the finished job may have the flush finish desired. Drill where indicated, using a No. 67 drill for the forthcoming dummy rivets which enhance the model's appearance, and cut out the plates as required. All the necessary holes and openings will be found in the pattern drawings or in the body assembly drawing. Some of the holes and openings will have to be established on the job, such as the port for the automatic gun and so forth.

Before cutting the metal (or plywood) parts which

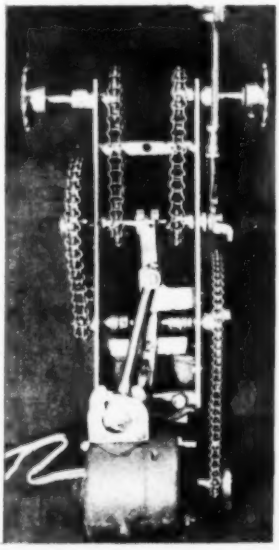
Left: Truck frames are countersunk for screw heads on the drill press. *Below, left:* Grim and ready for action. Imitation rivets add a lot to the model's authenticity. *Right:* With turret off gun mechanism is exposed. Main parts are electro magnet and trip hammer (see sketch). Long wire spring holds "shells" in magazine.

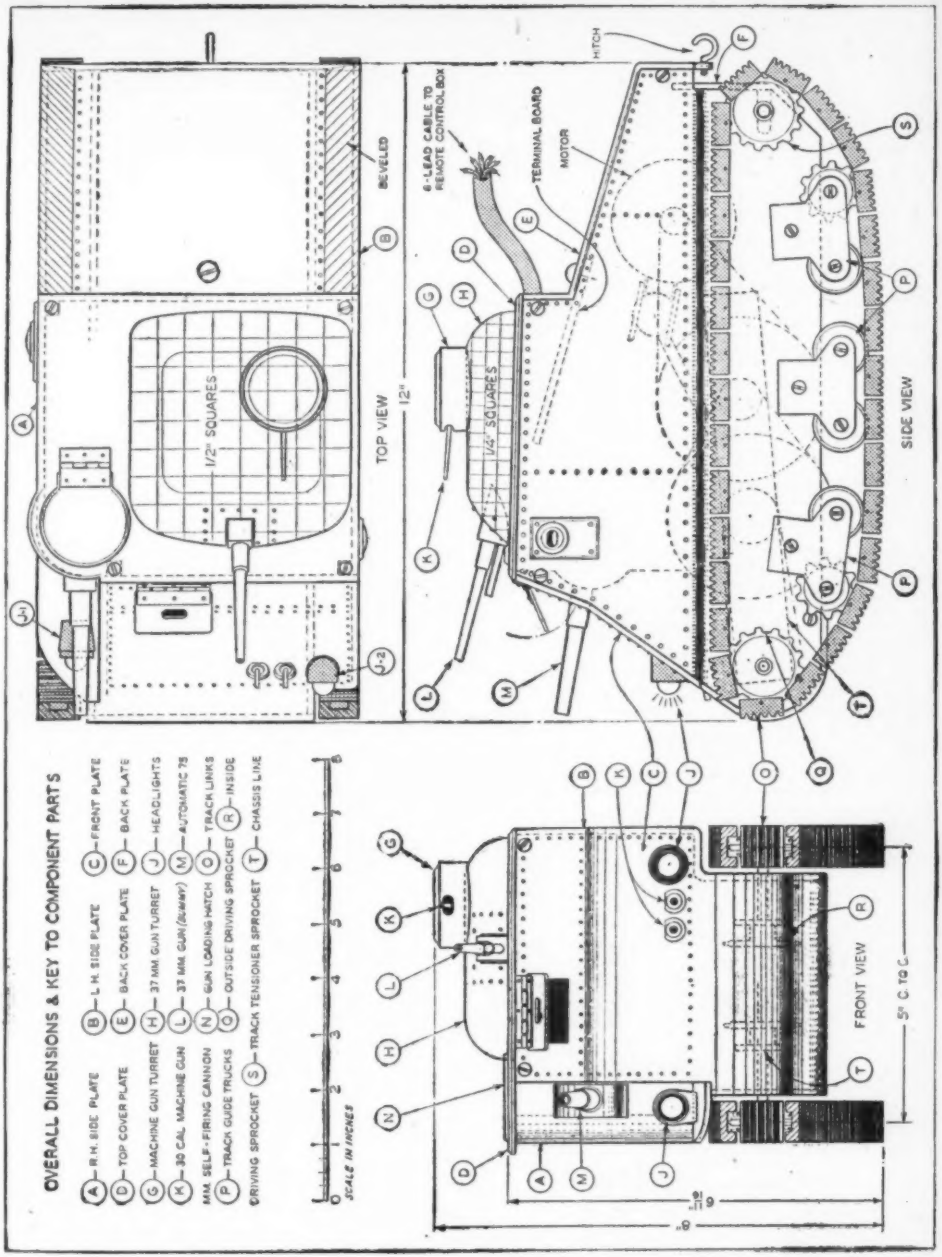





CHASSIS (T) PLANS
SCALE IN INCHES
NOTE: ALL SHAFTS TO BE OF 3/16" DIA DRILL ROD EXCEPT IDLER SHAFT FOR SPROCKETS (S)
ALL SPROCKETS TO BE CUT FROM 3/32" BRASS. TEETH TO CONFORM (SEE FULL SIZE DETAIL OF TEETH IN DRAWINGS STEERING TRUCK (F)
OLD AUTO FAN MOTOR COMPLETE WITH BALL JOINT MOUNT
MOTOR SPROCKET
BALL MAGNET
SPROCKET (32 TEETH)
CLUTCH SHIFT (STEERING) LEVER
GUN COCKING LEVER (TO LIFT)
BAR PIVOTED TO CLUTCH SHIFT LEVER
R&L HAND WORMS
SLIDING DOG CLUTCH
KEYWAY
PIN
BUSHING
SPROCKETS (R) 14 TEETH
PLAN VIEW
BRACKET OF STRAP METAL
SOLDER ROD TO MOTOR
BALL JOINT MOUNT
CHAIN LINE
CHASSIS FRAME (T)
BRACE
1/8" DIA ROD BRACE
MAGNET
RETURN SPRING
CLUTCH
TAKE UP ON BOLTS TO ADJUST TREAD TENSION
BOLTS TO BODY ON SIDE (4) ONLY
PARTIAL SECTION
FLEXIBLE FLAT SPRING BRACE
6-32 BOLT BRACE TO FRONT PLATE (C)
114

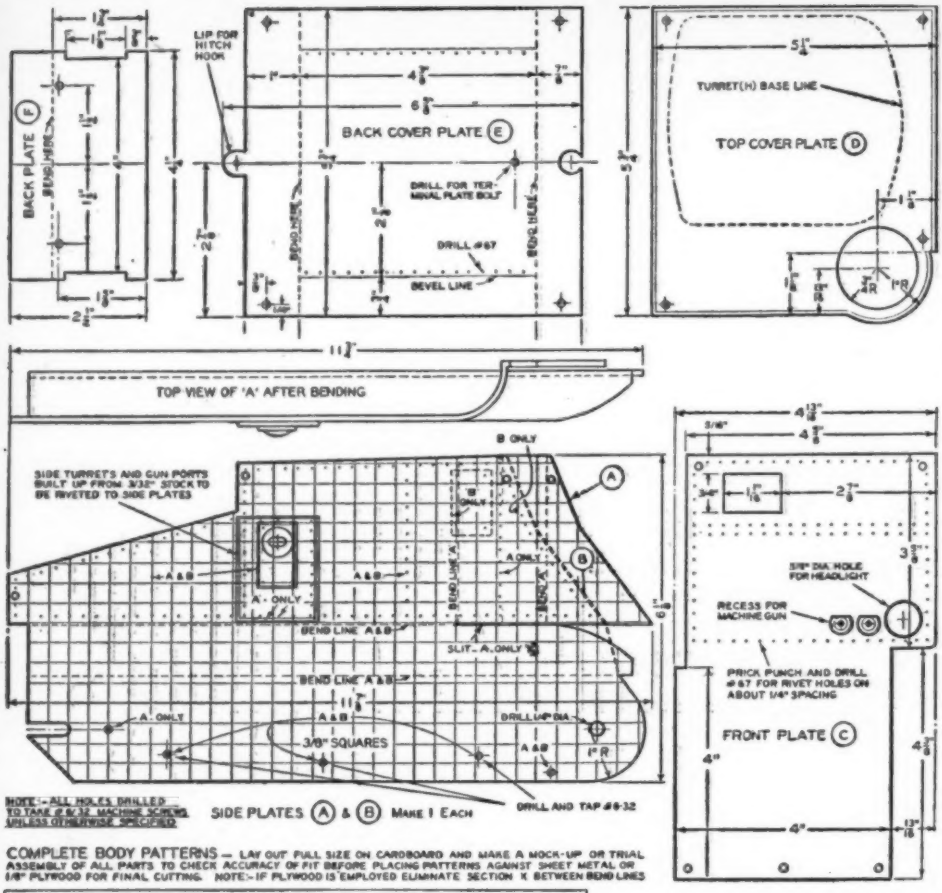
Details of driving equipment are shown here in drawing and photo. Comparing the two will clarify the layout and construction.



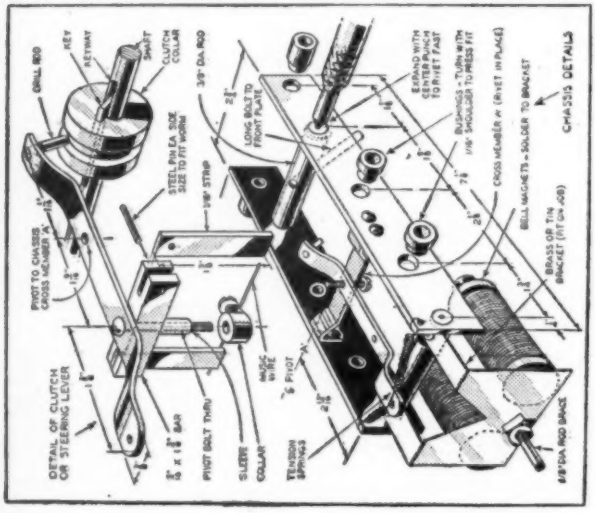


General plans and reference to principal parts. The position of the chassis and driving unit is indicated in broken lines. Chassis is attached to the body by two bolts only. One of these is secured to the bottom of the front plate (see body assembly drawing) while the other point of attachment is in the form of a strip metal lug which runs from the motor to the side plate (A) between the aft truck (P) and the slot for the rear (idler) sprocket. This sprocket slides in the slot mentioned and is adjustable by means of two 6/32 threaded set screws.

comprise the body it is recommended that a mock-up or trial body construction be made from heavy cardboard to check bends and fit. It will be noted that the side (A) differs from


BACK PLATE (E)
LIP FOR HITCH HOOK
BACK COVER PLATE (E)
DRILL FOR TERMINAL PLATE BOLT
DRILL #67
BEVEL LINE
BEND HERE
TURRET(H) BASE LINE
TOP COVER PLATE (D)
TOP VIEW OF 'A' AFTER BENDING
SIDE TURRETS AND GUN PORTS BUILT UP FROM 3/32" STOCK TO BE RIVETED TO SIDE PLATES
B ONLY
A ONLY
BEND LINE A&B
SLIT-A ONLY
3/8" SQUARES
DRILL AND TAP #6-32
3/16" DIA HOLE FOR HEADLIGHT
RECESS FOR MACHINE GUN
PRICK PUNCH AND DRILL #67 FOR RIVET HOLES ON ABOUT 1/4" SPACING
FRONT PLATE (C)
NOTE:-ALL HOLES DRILLED TO TAKE #6-32 MACHINE SCREWS UNLESS OTHERWISE SPECIFIED
SIDE PLATES (A) & (B) MAKE 1 EACH

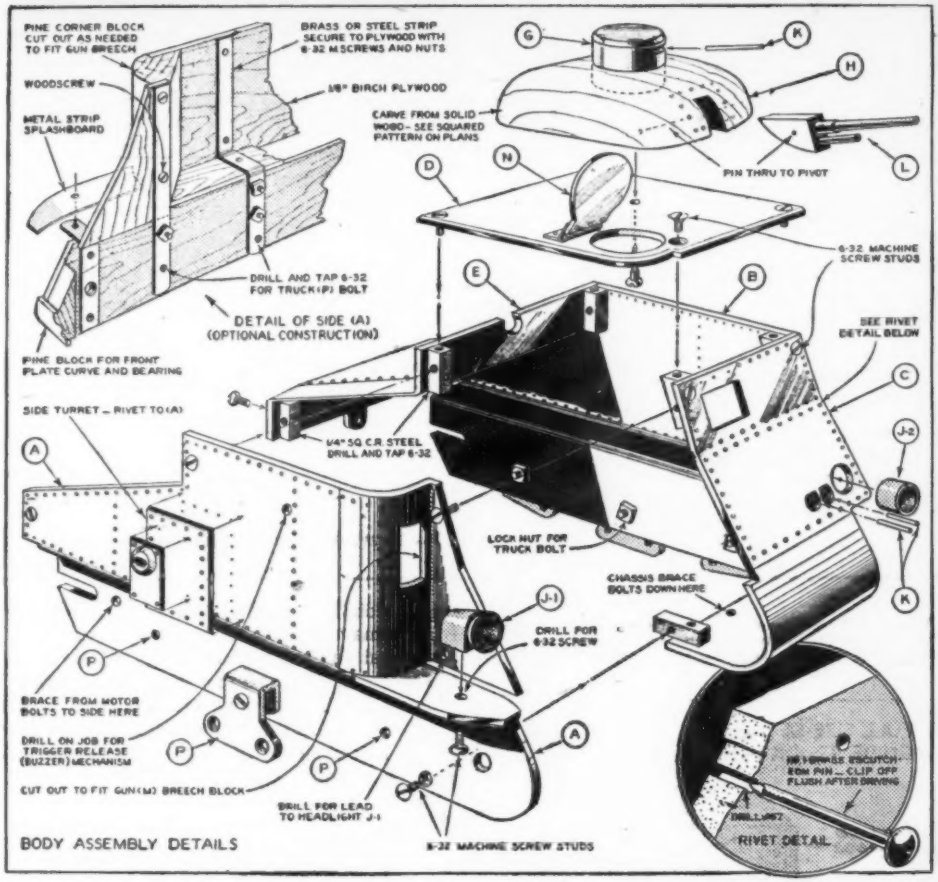
COMPLETE BODY PATTERNS — LAY OUT FULL SIZE ON CARDBOARD AND MAKE A MOCK-UP OR TRIAL ASSEMBLY OF ALL PARTS TO CHECK ACCURACY OF FIT BEFORE PLACING PATTERNS AGAINST SHEET METAL OR 1/8" PLYWOOD FOR FINAL CUTTING. NOTE:-IF PLYWOOD IS EMPLOYED ELIMINATE SECTION X BETWEEN BEND LINES



Lay out full size plans from these patterns and make a trial set up of the complete body before transferring the patterns to the metal or plywood from which they are to be cut. It will be noted by referring to the body assembly drawing that side (A) has a more complicated series of bends than has side (B)—If plywood is employed these bends must be accomplished by building up with blocks where necessary as shown in the detail of the body assembly drawings. Most of the required holes are shown in these patterns but one or two, notably those required for the cannon (M) mount and the headlight (J-1) are omitted here to avoid confusion. The location of these holes is clearly indicated in the body assembly drawing. Scale for these patterns can easily be established by the 3/8" squares on which the sides (A) & (B) are laid out. *Right:* Clutch mechanism and installation in chassis.

the (B) side in that it must be bent to form of the semi-circular turret which houses the firing gun.

The body plates are as-


PINE CORNER BLOCK CUT OUT AS NEEDED TO FIT GUN BREECH
BRASS OR STEEL STRIP SECURE TO PLYWOOD WITH 6-32 M.SCREWS AND NUTS
WOODSCREW
1/8" BIRCH PLYWOOD
METAL STRIP SPLASHBOARD
CARVE FROM SOLID WOOD- SEE SQUARED PATTERN ON PLANS
PIN THRU TO PIVOT
DRILL AND TAP 6-32 FOR TRUCK (P) BOLT
DETAIL OF SIDE (A) (OPTIONAL CONSTRUCTION)
6-32 MACHINE SCREW STUDS
SEE RIVET DETAIL BELOW
PINE BLOCK FOR FRONT PLATE CURVE AND BEARING
SIDE TURRET - RIVET TO (A)
1/4" SQ. C.R. STEEL DRILL AND TAP 6-32
LOCK NUT FOR TRUCK BOLT
CHASSIS BRACE BOLTS DOWN HERE
DRILL FOR 6-32 SCREW
BRACE FROM MOTOR BOLTS TO SIDE HERE
DRILL ON JOB FOR TRIGGER RELEASE (BUZZER) MECHANISM
CUT OUT TO FIT GUN (M) BREECH BLOCK
DRILL FOR LEAD TO HEADLIGHT J-1
BODY ASSEMBLY DETAILS
6-32 MACHINE SCREW STUDS
RIVET DETAIL

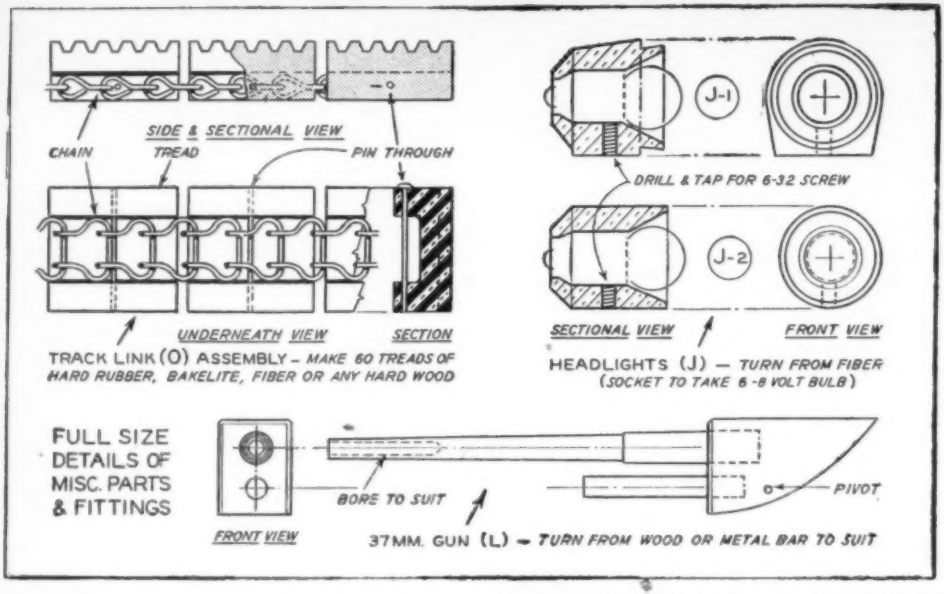
General assembly of the body shown here follows the original construction which is based on the use of 1/8" metal plate. If metal is not available plywood may be substituted as shown in the detail construction drawing of a portion of side plate (A). Pine blocks should be used at corners and at all points where pieces are to be joined. Actual joints can be completed with small woodscrews. The metal strips indicated are required to stiffen the structure as well as to provide bearing surfaces for the truck (P) stud bolts and for the front and rear sprocket shafts. A pine block should be carved to the contour of the body where the gun (M) projects. An aperture should be cut in this block to accommodate the gun and the block cut away as may be needed to clear the magazine and firing mechanism.

sembled and secured by corner posts or bearing blocks which are drilled and tapped for 6/32 machine screws throughout. In the case of plywood these blocks can be made of wood and the fastenings achieved with small flat head woodscrews as indicated in detail of plywood construction.

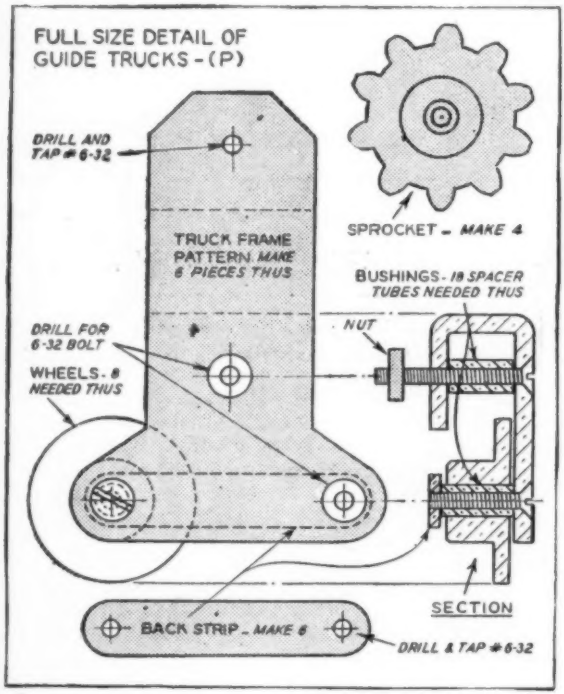
Before assembling the body it is well to put in the escutcheon pins which become the dummy rivets. Use No. 1 (1/4") brass escutcheon pins throughout, drilling for them with a No. 67 drill, and clip off the projecting ends flush with the inside surface of the plates. This may not seem important but later on it will be easier to make adjustments to the "works" without several hundred needle like points in the way—which is just what you may expect if you leave the pins projecting.

The gun turrets which occupy most of the roof were built of hammered metal in the original, but there is no reason why solid wood should not be used for the purpose, and this form of construction is recommended here. The .30-cal. machine gun turret may be turned from wood or it may be made from a small tin. These turrets are non-operating, and as long as they conform to the general dimensions given may be built from whatever materials are most easily procurable.

Before laying the body work aside the


SIDE & SECTIONAL VIEW
CHAIN
TREAD
PIN THROUGH
UNDERNEATH VIEW
SECTION
TRACK LINK (O) ASSEMBLY – MAKE 60 TREADS OF HARD RUBBER, BAKELITE, FIBER OR ANY HARD WOOD
J-1
DRILL & TAP FOR 6-32 SCREW
J-2
SECTIONAL VIEW
FRONT VIEW
HEADLIGHTS (J) – TURN FROM FIBER (SOCKET TO TAKE 6-8 VOLT BULB)
FULL SIZE DETAILS OF MISC. PARTS & FITTINGS
BORE TO SUIT
PIVOT
FRONT VIEW
37MM. GUN (L) – TURN FROM WOOD OR METAL BAR TO SUIT

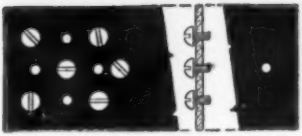
Above: Make the treads, etc. *exact* size as laid out in the drawing. *Below:* Actual size pattern for truck frame and small tread sprockets. Bend frames on dotted lines to shape.


FULL SIZE DETAIL OF GUIDE TRUCKS - (P)
DRILL AND TAP # 6-32
TRUCK FRAME PATTERN. MAKE 6 PIECES THUS
SPROCKET – MAKE 4
BUSHINGS - 18 SPACER TUBES NEEDED THUS
NUT
DRILL FOR 6-32 BOLT
WHEELS - 8 NEEDED THUS
SECTION
BACK STRIP – MAKE 6
DRILL & TAP # 6-32

minor details should be made. The outside turrets may be of sheet metal or of plywood. Note that the right-hand turret differs from the left one. Put the tow hook on as shown. It can be any small curtain hook. Make the lamps next. These are turned in the lathe from any non-conducting material to the size and shape given in the *actual size* detail drawings. They should be drilled to form an easy socket for standard 6.8 volt bulbs. The right-hand lamp is attached to the splash board or track guard with a small machine screw. The other lamp is recessed into the front plate as shown.

The 6.8 volt bulbs, connected in series, are just right for the 13 volts coming through the transformer, and all controls except the motor are connected to the 13 volt post. The motor, being controlled through the rheostat, may use any amount of current, or none at all, without changing the voltage for the controls. The dummy machine guns which fit into the recessed embrasures on the front plate next to the port headlight may be of aluminum tube, dowels or any similar material.

The dummy 37 mm. gun which



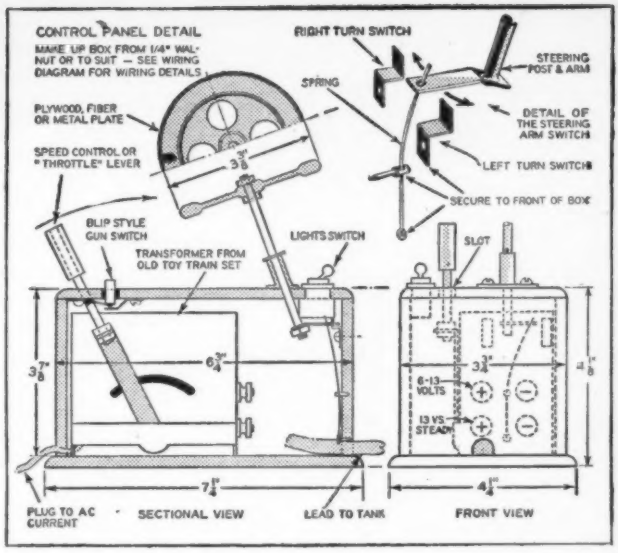
Half-size layout and section through terminal board.

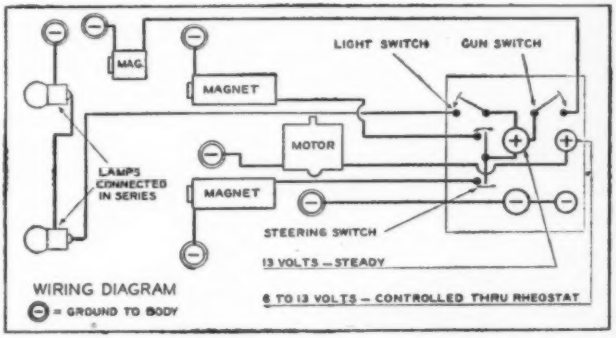
projects from the main deck turret may likewise be built of dowels or turned from solid hardwood or metal bar. The gun-loading hatch and the hinged port over the observation opening in front should now be made and riveted in place with short pieces of No. 1 brass escutcheon pins. This about completes the body and the chassis can be started.

The chassis frame may be of two pieces of ¾" or 1" brass or steel 7⅛" long. Material $\frac{3}{32}$" thick is satisfactory for the purpose. Drill each piece for the sprocket spindles, the cross bars, etc., as noted on the plans. These frame sides should be drilled at one time (as one piece that is to say) to ensure accurate alignment. Put in the shaft spindle bushings. They may be turned from brass or steel to suit. Bushings and cross bars are riveted to the frame after leaving a slight shoulder on each, as shown. In drilling for the shafts, all of which are standard $\frac{5}{16}$" drill rod, allow an easy running fit and not more. Bushings might be drilled (although not shown in drawings) with small oil holes.

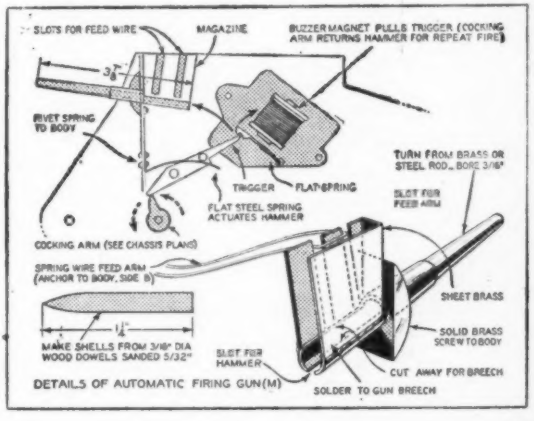
The primary reduction shaft has two small, ½" dia. collars, or worms. Secondary (dog clutch) shaft has many duties to perform as it drives the tank, steers it and keeps the gun in cocked position. The sliding dog clutch shaft requires a leeway as this clutch moves from side to side to engage the drive sprockets individually for steering purposes.

The two small sprockets, one on each side, are held in place by cotter pins and may rotate independently of each other. [*Continued on page* 158]


CONTROL PANEL DETAIL
MAKE UP BOX FROM 1/4" WALNUT OR TO SUIT — SEE WIRING DIAGRAM FOR WIRING DETAILS
PLYWOOD, FIBER OR METAL PLATE
SPEED CONTROL OR "THROTTLE" LEVER
BLIP STYLE GUN SWITCH
TRANSFORMER FROM OLD TOY TRAIN SET
RIGHT TURN SWITCH
SPRING
STEERING POST & ARM
DETAIL OF THE STEERING ARM SWITCH
LEFT TURN SWITCH
SECURE TO FRONT OF BOX
LIGHTS SWITCH
SLOT
6-13 VOLTS
13 VS. STEADY
PLUG TO AC CURRENT
SECTIONAL VIEW
LEAD TO TANK
FRONT VIEW

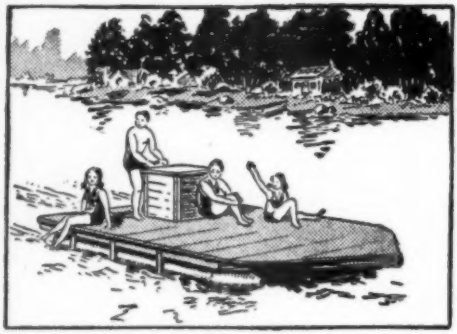


Study wiring diagram and switch box details carefully before making any electrical connections. *Below:* How the 75 mm. gun is made.

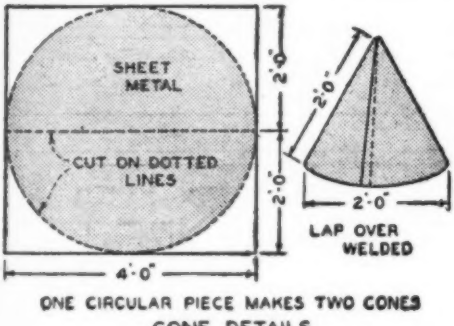

SLOTS FOR FEED WIRE
MAGAZINE
BUZZER MAGNET PULLS TRIGGER (COCKING ARM RETURNS HAMMER FOR REPEAT FIRE)
RIVET SPRING TO BODY
TURN FROM BRASS OR STEEL ROD, BORE 3/16"
TRIGGER
FLAT SPRING
SLOT FOR FEED ARM
FLAT STEEL SPRING ACTUATES HAMMER
COCKING ARM (SEE CHASSIS PLANS)
SPRING WIRE FEED ARM (ANCHOR TO BODY, SIDE B)
SHEET BRASS
SOLID BRASS SCREW TO BODY
MAKE SHELLS FROM 3/16" DIA WOOD DOWELS SANDED 5/32"
SLOT FOR HAMMER
CUT AWAY FOR BREECH
DETAILS OF AUTOMATIC FIRING GUN(M)
SOLDER TO GUN BREECH

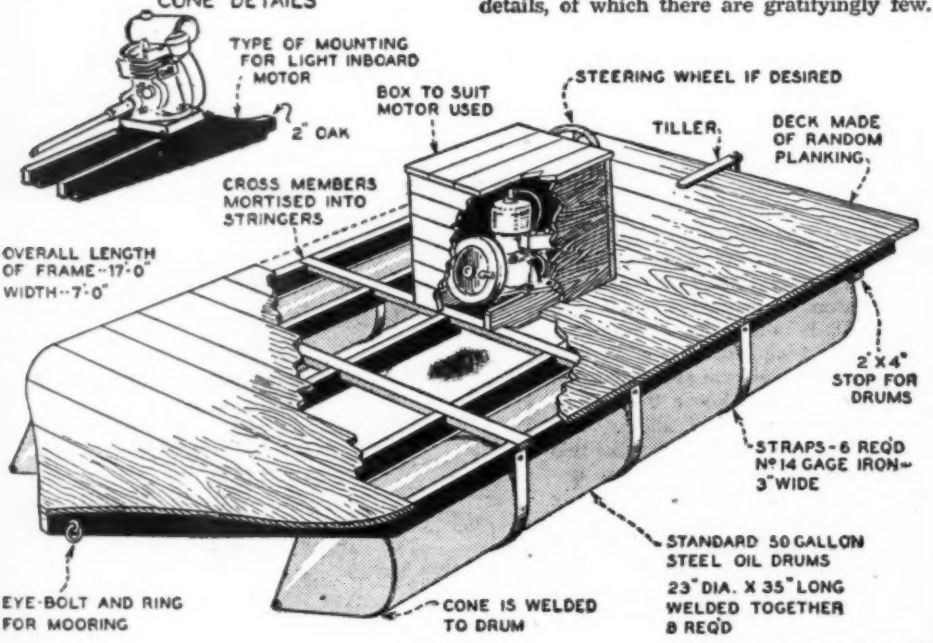
Fun on the Lake!—

by Peter Clarke

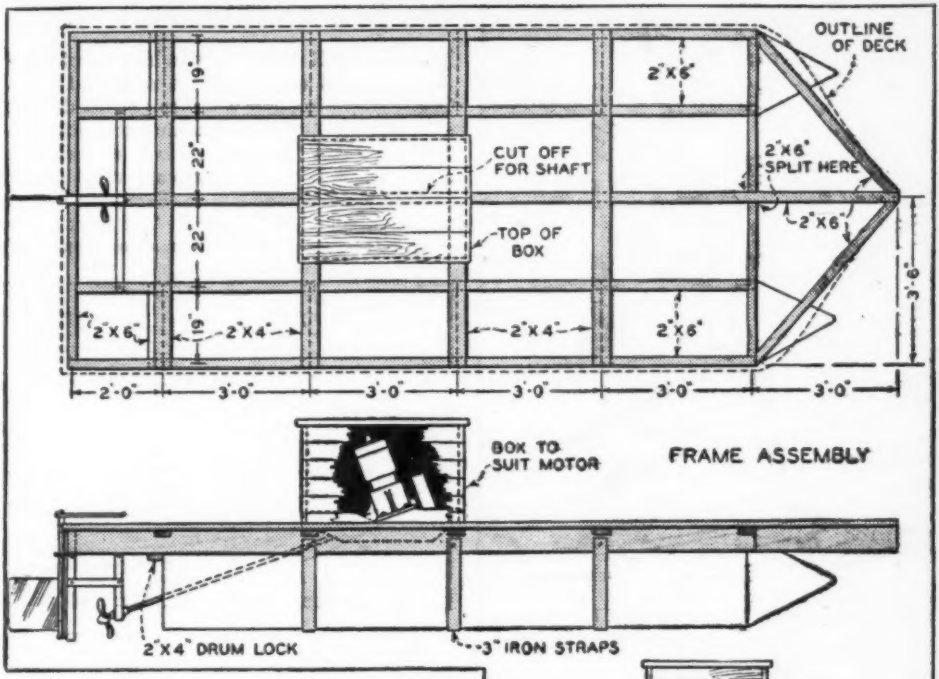


TUBBY, although not exactly beautiful to look at, represents a very useful and comfortable way of getting around on lakes and small sheltered coves. She was designed with the idea of producing a very simple-to-build craft that would give the maximum amount of deck space with the minimum expense. In spite of her ungainly appearance, with a four horsepower motor she can whip herself up to a fair and honest five miles an hour, and with over one hundred square feet of useful deck space available, there is ample room for swimming, diving, fishing, or even small parties. On one occasion, with the aid of a piece of tin on the fore deck, a very respectable weinie roast was held while slowly cruising along the lake. And the luxury of having a fishing party with three or four people fishing from deck chairs was formerly reserved for those fortunate enough to own forty foot cruisers. But *Tubby*, though admittedly not as pretty, is every bit as much fun to own. And she can be built very inexpensively, especially if second hand materials are used wherever possible. So now, on to the details, of which there are gratifyingly few.




TYPE OF MOUNTING FOR LIGHT INBOARD MOTOR
2" OAK
BOX TO SUIT MOTOR USED
STEERING WHEEL IF DESIRED
TILLER
DECK MADE OF RANDOM PLANKING
CROSS MEMBERS MORTISED INTO STRINGERS
OVERALL LENGTH OF FRAME--17'-0"
WIDTH--7'-0"
2"X4" STOP FOR DRUMS
STRAPS-6 REQ'D Nº14 GAGE IRON-3"WIDE
STANDARD 50 GALLON STEEL OIL DRUMS
23" DIA. X 35" LONG WELDED TOGETHER 8 REQ'D
EYE-BOLT AND RING FOR MOORING
CONE IS WELDED TO DRUM

— Build "TUBBY"

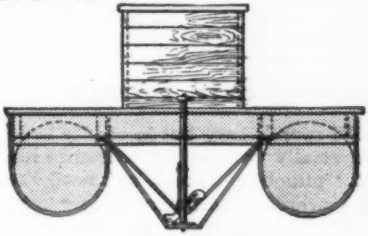


As can be seen from the pictures and drawings, *Tubby* depends primarily on oil drums to keep afloat. In fact, she is really just a more or less streamlined diving raft with a motor attached. She carries eight standard 50 gallon oil drums, arranged in two rows of four each.

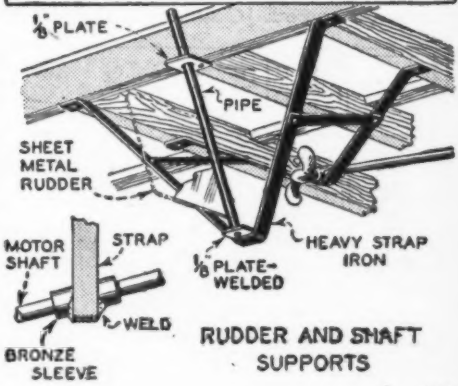
If a bigger deck is desired, the number of drums can be increased accordingly. However, *Tubby* will carry four people comfortably, and as many as eight have been crowded aboard for special occasions. The two by six stringers are laid lengthwise, and are set at such a distance apart that the drums are held securely in place, but still do not touch the under side of the deck.

The job should be started first by studying carefully the drawings, photographs, and text. Then, if you are anything like the average man, you will probably throw them away and build it the way you think it should be. Such procedure is not exactly advisable, but if you *must* do it that way, at least study the details first.

The 2"x6" stringers are notched for the 2"x4"'s and are [*Continued on page* 164]

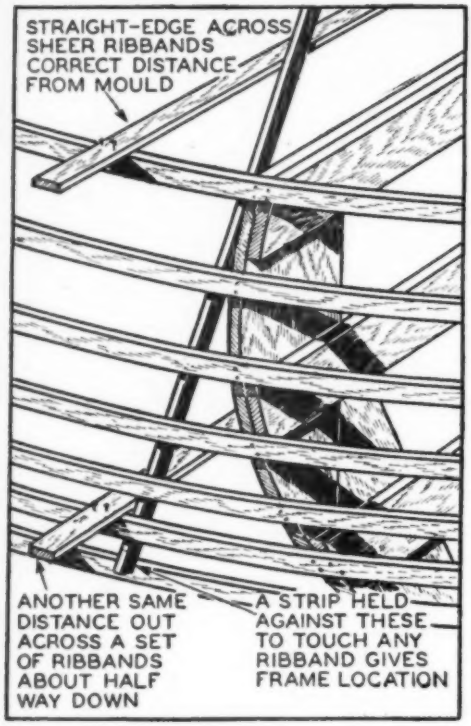


REAR VIEW



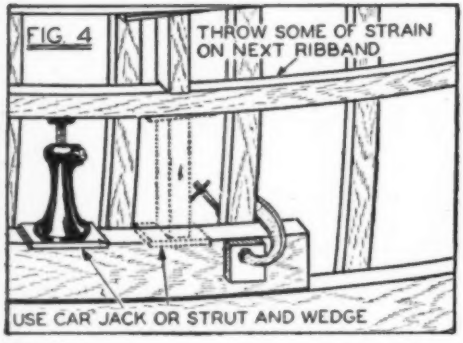
RUDDER AND SHAFT SUPPORTS

KINKS FOR BOAT BUILDERS


STRAIGHT-EDGE ACROSS SHEER RIBBANDS CORRECT DISTANCE FROM MOULD
ANOTHER SAME DISTANCE OUT ACROSS A SET OF RIBBANDS ABOUT HALF WAY DOWN
A STRIP HELD AGAINST THESE TO TOUCH ANY RIBBAND GIVES FRAME LOCATION

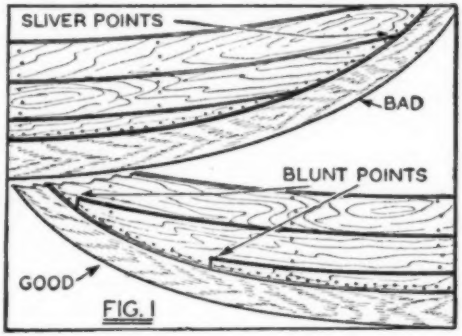
Locating Bent Frames

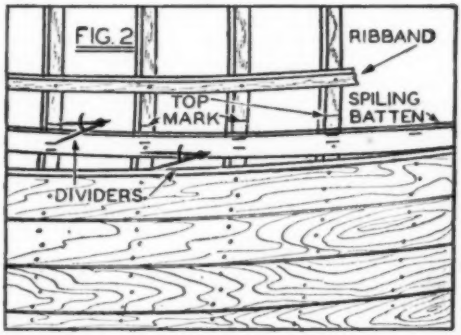
THIS sounds easy but in reality is difficult especially when a set of frames must be exactly plumb to take a bulkhead. Amidships marks can be made along every other ribband to give points to bend the frames to, but as you work forward and aft where bulkheads are usually located the sides come in and throw one off. [*Continued on page* 166]

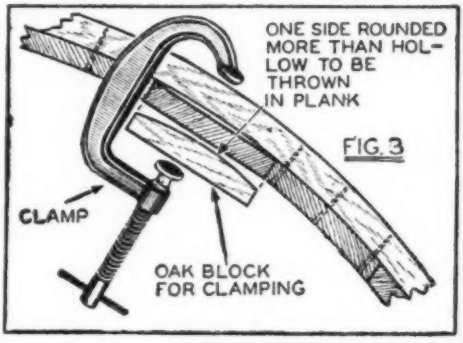


For Better Planking

PLANKING which ends in long points forward will cause trouble now and later. There is not enough wood to permit driving a fastening without weakening the point, so holding must depend almost entirely on caulking. A better way is to saw off the point leaving a 1-in. wide end to which the rabbet will give sufficient backing. The next plank is then left wide [*Continued on page* 166]





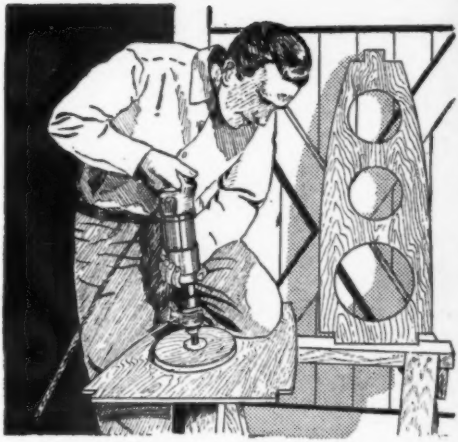


Hole Saws Or Saw Drills

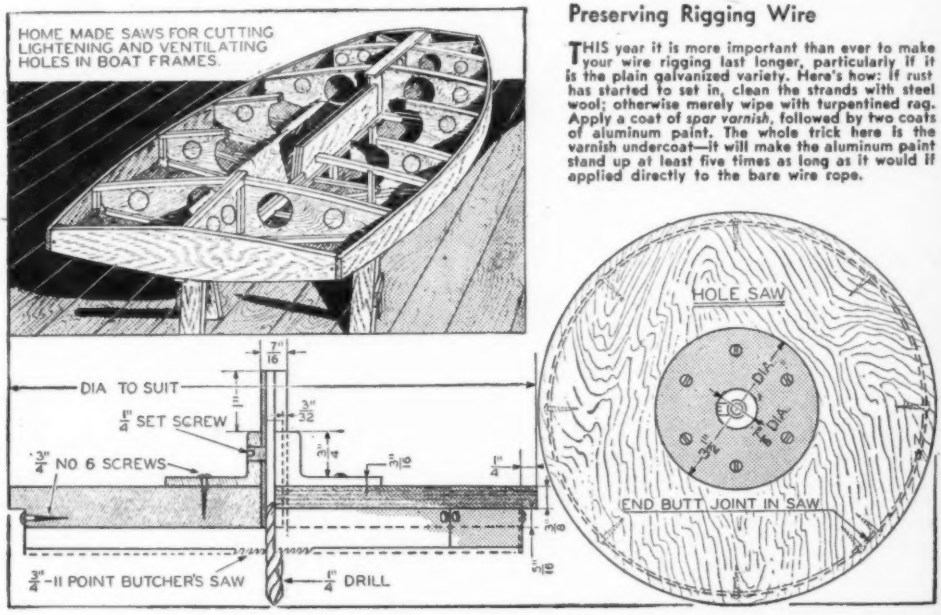
THE home made saws illustrated for cutting holes up to 12" in diameter were developed for cutting lightening and ventilating holes in boat frames, but can also be used for a variety of purposes. The cutters shown cut through ⅜ plywood; however, by turning the stock over and cutting from the other side, it will cut through ¾" stock. The saws can be used in a hand drill press or an electric hand drill, or electric drill press. The saws are easy to make, and save a great deal of time if there are a number of holes to be cut.

The drawing shows the construction. The wood disks are turned on a lathe. The saws are cut from ¾-inch, 11 point, butcher saw blades which come in coils 25 feet long and are fastened to the disks with ¾", No. 6 screws. The metal face plate can be cast of aluminum, iron, or bronze. The bushing is a drive or press fit, and a short ¼ centering drill is fastened in place with a ¼" headless set screw. One face plate assembly can be used on wood disk and saw assemblies of various diameters.

If casting facilities are not available a face plate from a small wood turning lathe can be fitted to the wood disk, and will serve the purpose well. Face plates of this type can usually be bought from second-hand machine tool dealers.

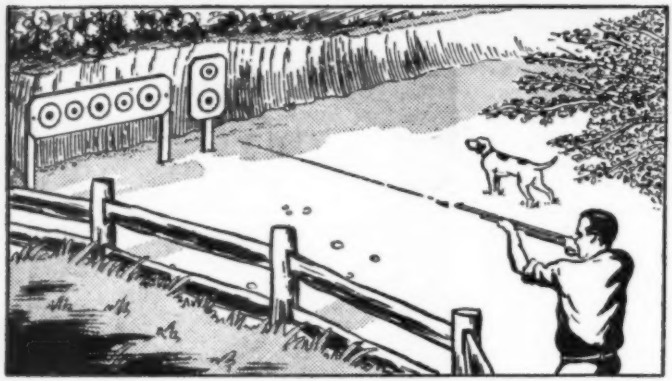


An advantage of this type of saw drill is that it can frequently cut a hole to lighten a bulkhead or other structure after the structure is already in place. This cannot always be done with other types of circle cutting tools. In order to use it on previously built hulls, etc., it should be operated with a heavy power drill, not turning at too rapid a speed. Smaller diameters are best for this type of operation.—*Alvin Younquist.*



Preserving Rigging Wire

THIS year it is more important than ever to make your wire rigging last longer, particularly if it is the plain galvanized variety. Here's how: If rust has started to set in, clean the strands with steel wool; otherwise merely wipe with turpentined rag. Apply a coat of *spar varnish*, followed by two coats of aluminum paint. The whole trick here is the varnish undercoat—it will make the aluminum paint stand up at least five times as long as it would if applied directly to the bare wire rope.



PRACTICE ON CAN COVERS

by H. E. Moore

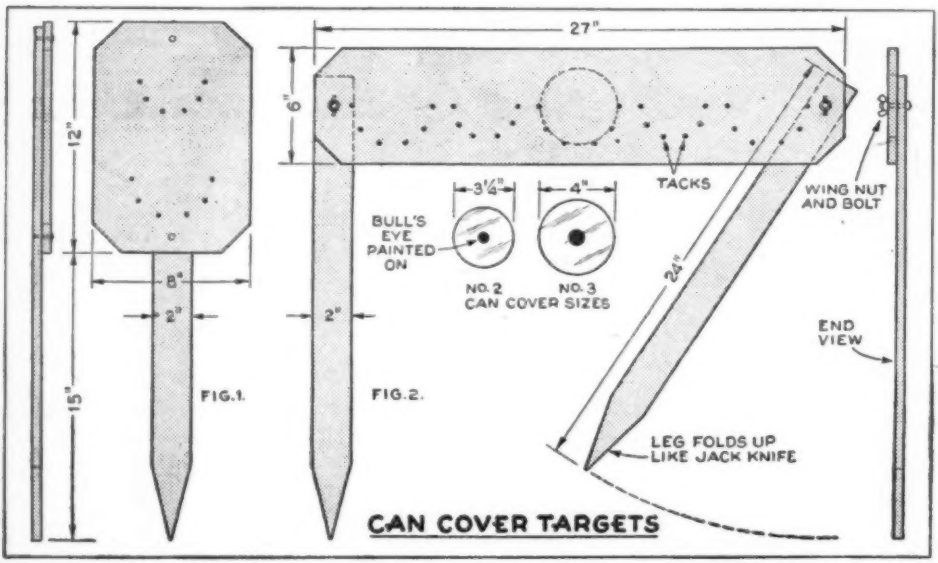
WITH government restrictions on the use of tin and other metal containers of food, tobacco, etc.; and the salvaging of such metals for use in the war emergency—the once familiar and homely garden variety of tin can that has so long graced, or disgraced our back yard ash heaps—seems about to vanish from the landscape.

With the disappearance of this universal container that had so many uses after it had served its initial purpose — what will the small boy do for a tin can to tie to the dog's tail—or for "squackers" on Hallowe'en night—?

Even our can for fishing worms may be threatened with extinction — or moral compunction against its use on patriotic grounds. To think that it may be considered an act of sabotage to be caught sneaking down to the lake to fish with a can of worms hidden in your pocket . . . "My gawd—what is this world a comin' to—?"

Not to mention "Tin Can-less Weddings" —in which even old shoes and rubbers may be banned as bad form in this war time emergency . . . And the plight of the humble hobo (who may become an extinct animal for the duration) whose sole utensil for meat, drink and cooking depended upon the empty tin can he could pick up anywhere in his natural jungle habitat—?

Even poor old Happy Hooligan may have to doff his tin-can "Katy," long the emblem of honor of his humble fraternity, and give it to Uncle Sam— [*Continued on page* 168]



PNEUMATIC TARGET PISTOL

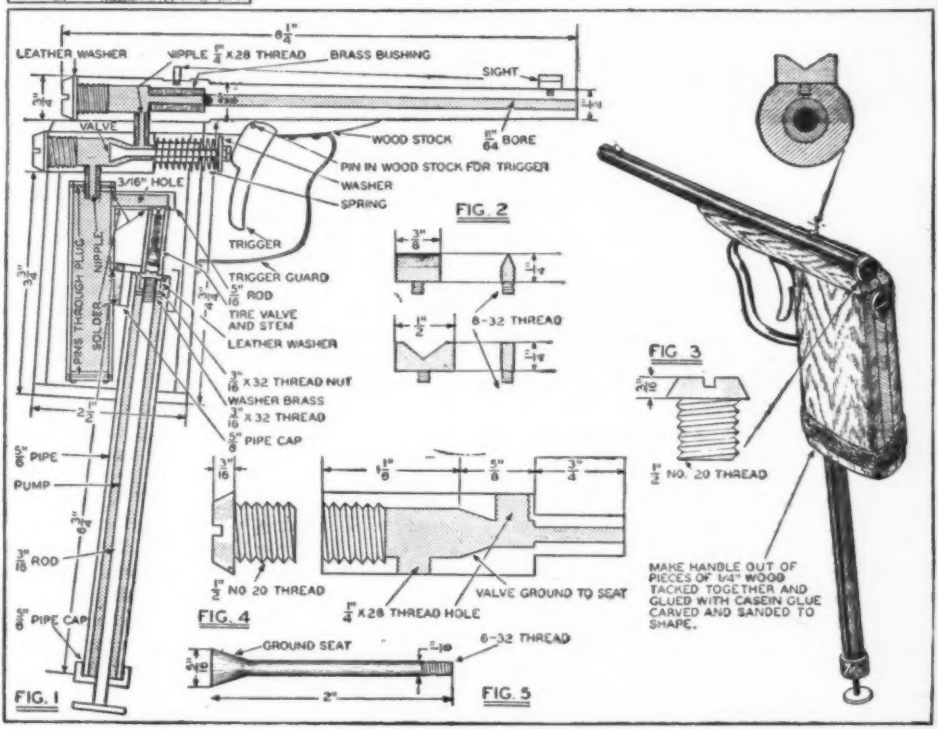
by Edward F. Waldron

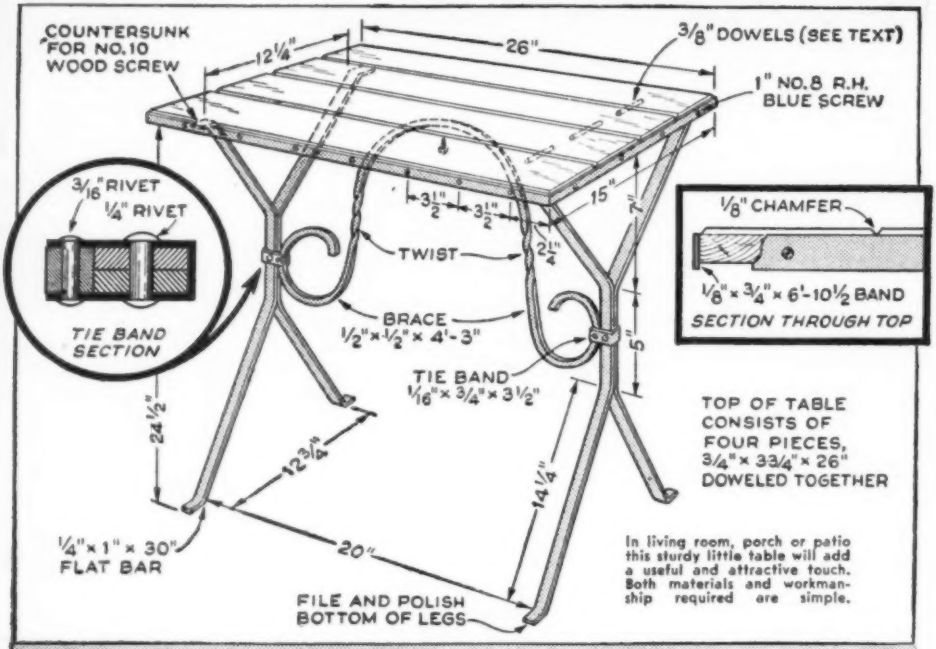
Making this pistol will be excellent training for your metal lathe work.

THIS air pistol is an interesting toy, yet it shoots hard enough to break a milk bottle, and can be used for target practice or even for killing small game at reasonable range. It must, therefore, be given the careful handling required for any gun or weapon capable of inflicting a wound, however slight.

The pistol is essentially a metal-turning lathe project, and anyone possessing such equipment in his workshop will have no difficulty with the elementary gunsmithing involved. The drawings give necessary details and dimensions; a brief study of the sectional sketch will make clear the gun's simple but effective construction and firing action. The force with which the pellet is ejected from the muzzle depends upon the amount of air pressure pumped into the chamber, and needless to say, entire success of the gun's operation is based on a *perfect* seating of the valve.

The barrel is the first piece to be worked on. Bore it from a piece of 9"x¾" piece of soft iron rod. Start the boring with an 11/64" drill. When this drill is as deep as it will go, use another 11/64" drill to which a piece of $\frac{5}{32}$" drill rod has been welded. It is preferable to set the ¾" rod in the lathe strapped against a headstock center with the other end in the center rest. Be extremely careful to have your centers properly aligned, turn slowly, and avoid over-heating of the drill. [*Continued on page* 170]





Occasional Table by A. M. Youngquist

THE comfort and convenience of the living room are greatly increased if an occasional or end table is placed beside the davenport and each armchair.

The table shown is an attractive combination of wood and iron and is not difficult to make. The top is made of four pieces of walnut, gum-wood, or mahogany, ¾"x3¾"x26", with ⅛" chamfered edges, glued together with three ⅜" dowels in each joint. Or if preferred, two ½"x3" wood battens screwed on from below may be used in place of dowels, to give additional strength to the glued joints. The top should be sanded smooth, stained, filled, shellacked and varnished, or waxed.

The ⅛"x1" iron band to go around the top should be scored for bending from the finished top to insure a perfect fit. Drill holes for No. 8 screws in locations shown. The ends of the band should butt together midlength of one long side of the top, and a holding screw secure both ends. A notch for this screw can be filed in the band iron ends. Fasten the band to the wood with 1" round head blue No. 8 screws.

To make the legs cut four pieces of ¼"x1" mild steel flat bar 30½" long, and carefully score lines for the bends in accordance with dimensions on the plan. The bends are easily made cold if a heavy vise is used. Drill holes for 3/16" or ¼" rivets. Make sure all four legs are exactly alike and rivet them together in pairs as indicated on the drawing. File floor ends smooth and slightly rounded, and polish smooth so they will not mar wood floors.

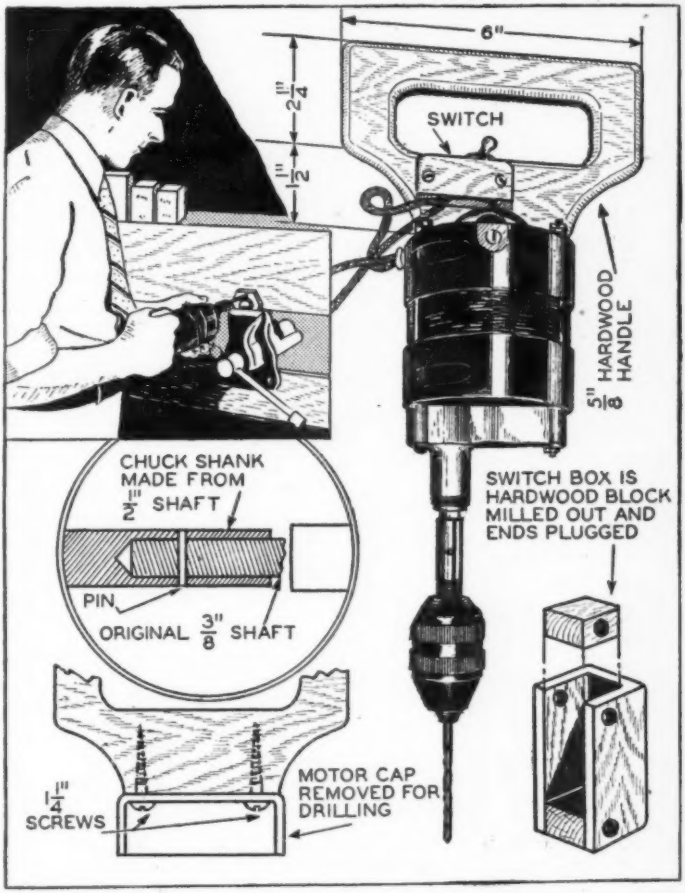
The center line brace of ½" square mild steel bar 4' 3" long, can be worked cold but it is easier to shape if red hot. To make the twist place the bar in a heavy metal vise with the mark for the twist even with the top of vise jaws and place a heavy wrench at the mark for the other end of the twist. Turn the wrench to make the required number of twists. A full size drawing of the brace should be made on [Continued on page 172]

LIGHT-DUTY POWER DRILL

Converted kitchen accessory motor makes good "handy" drill.

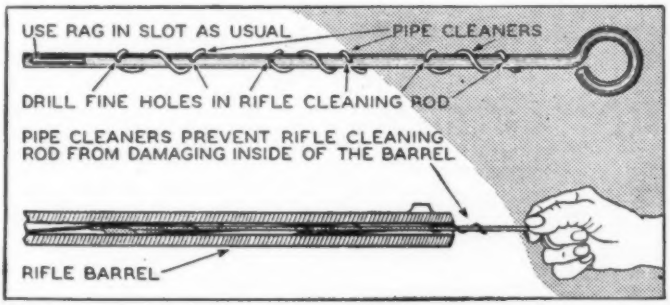
by Hi Sibley

THE motor of a fruit juicer that has outlived its usefulness can be adapted to other services, such as a hand drill. The transformation is very simple. Merely remove the motor from the original housing or metal cylinder of the juicer; also take out the switch. Take the cap off the end of the motor and drill two holes for screws into the wood handle; the latter scroll-sawed from $\frac{5}{8}$-in. hardwood. Attach the switch to it, installed in the small wooden case as illustrated. A serviceable chuck can be purchased for 50c. Make a shank for this from half-inch shafting, drilling a hole the proper size for the motor shaft, which is secured with a pin. The original drill was found unusually dependable for many jobs around the workshop. Motor is of good quality.

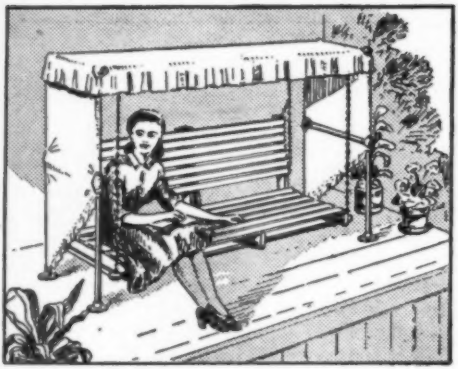


Pipe Cleaners Protect Rifle Barrel

RIFLE cleaning rods sometimes bow slightly in the middle when in use, scraping against the rifling grooves inside the barrel and possibly causing damage. This is especially likely to happen with the smaller caliber guns. A few pipe cleaners spiralled around the cleaning rod at intervals, with their ends anchored in small holes drilled through the rod, will eliminate this danger, yet clean bore efficiently.—*A. H. W.*

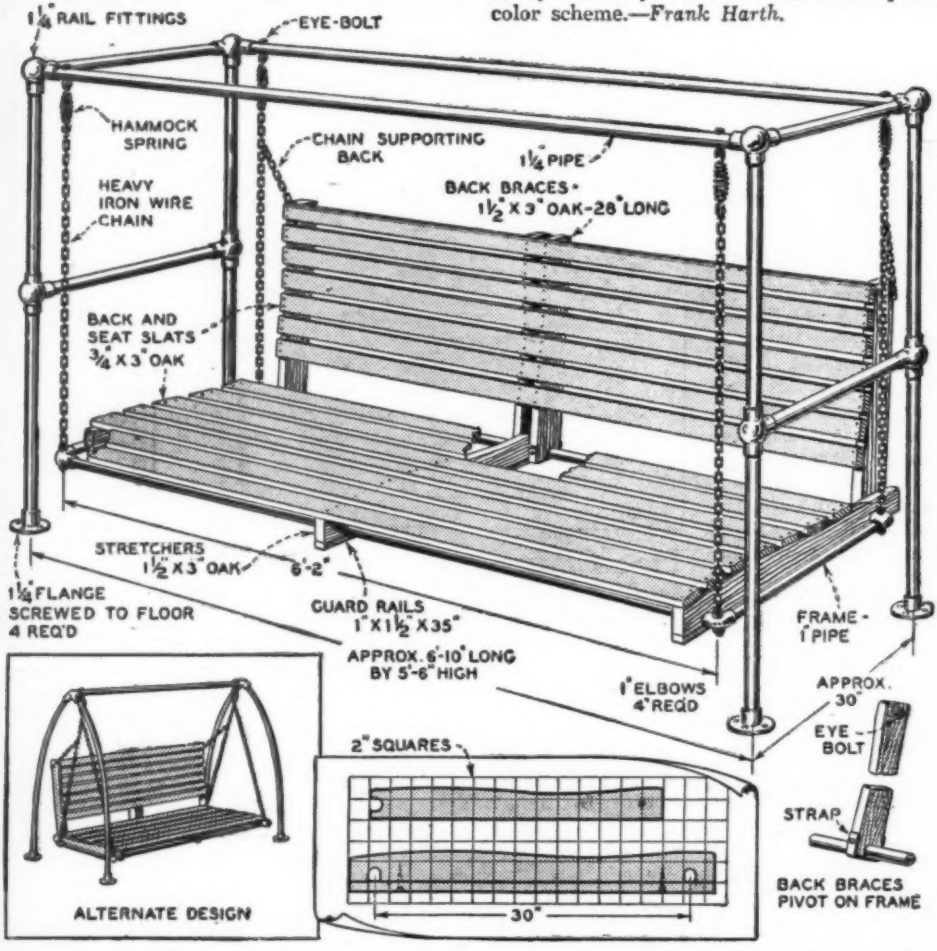

USE RAG IN SLOT AS USUAL
PIPE CLEANERS
DRILL FINE HOLES IN RIFLE CLEANING ROD
PIPE CLEANERS PREVENT RIFLE CLEANING ROD FROM DAMAGING INSIDE OF THE BARREL
RIFLE BARREL

PORCH SWING FROM PIPE



ILLUSTRATED on this page is a simple method for making an inexpensive but sturdy and comfortable porch swing or "glider." Two possible designs are shown, and can be used as the basis for whatever variations the builder desires to incorporate, or constructed as is.

Length and width dimensions indicated will be ample for average purposes. Height should be around 4½ to 5 feet. The pipe flanges that form the feet are bolted to the floor of the porch, or fastened down with lag screws. Any plumbing store can provide the necessary pipe and fittings. The slat seat is quite comfortable, but cushions may be provided for a really deluxe job. Enamel to match porch color scheme.—*Frank Harth.*



CONCRETE FENCE POSTS

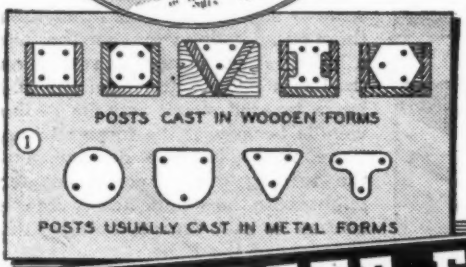
LONG-LIFE concrete posts, resistant to rot, insects, and fire, are easily made in simple forms. They serve as eye-appealing supports for clotheslines, fences, grapevines, mail boxes, garden and driveway lights, and bird feeders.

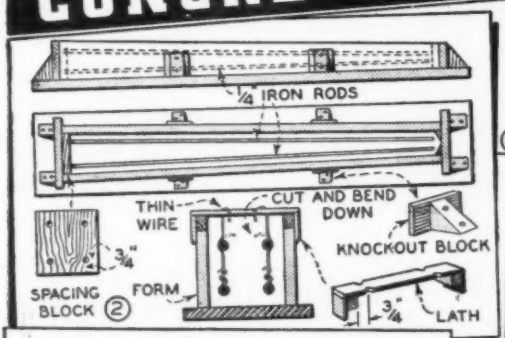
A satisfactory mixture for posts, as recommended by the Portland Cement Association, is as follows:

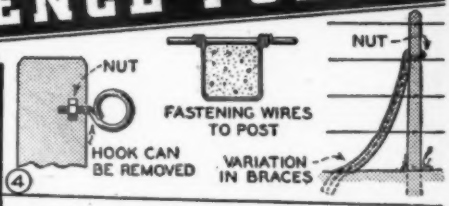
Portland cement		1 sack
Sand		1¾ cu. ft.
Pebbles, ¾ in. max.		2 cu. ft.
Water	for average wet sand	4 gal.
	for very wet sand	3¾ gal.
	for damp sand	4½ gal.

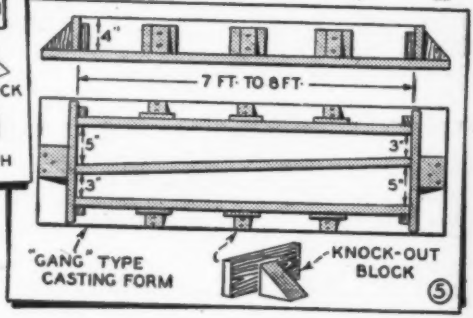
For colored concrete, use up to 9 lbs. of pigment to each sack of cement; and when the colors are light, use white Portland cement.

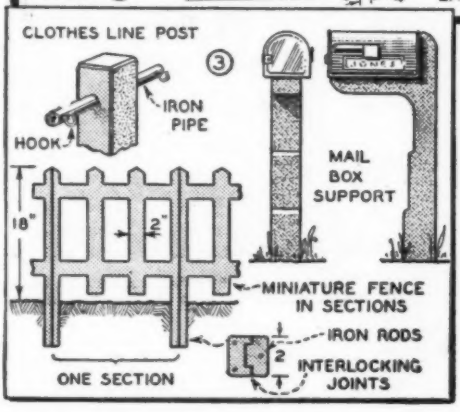
Manufactured metal molds are available for casting fence posts and other standard shapes; but it is easy to make molds or forms from sound, straight lumber, preferably planed and perhaps sanded on surfaces that touch the concrete. Use 2-in. boards for ends and sides and 1-in. boards for dividers between sections of gang molds. Arrange bracing blocks to support these boards, and insert knock-out pieces ½-in. or more thick between braces and side pieces. These blocks can be slightly wedge-shaped. Each board that touches concrete should be oiled with a brush or by [*Continued on page* 170]



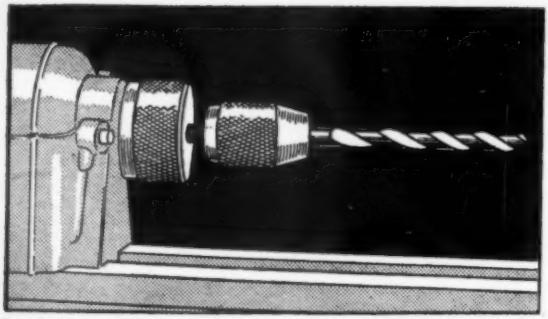








Drill Chuck Adapter



The finished adapter is mounted as above when using drill chuck in lathe.

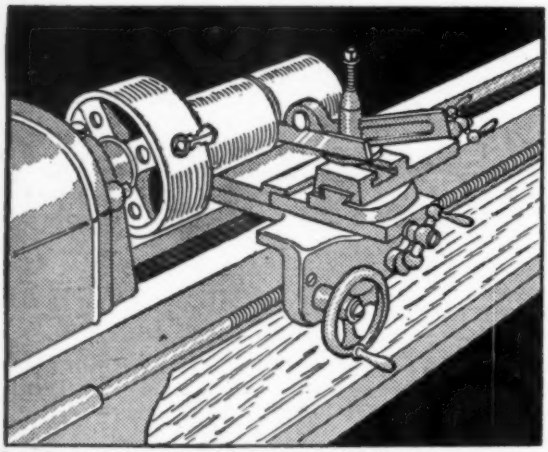
Many lathe jobs will be greatly simplified by this easily made attachment.

by Donald Levenson

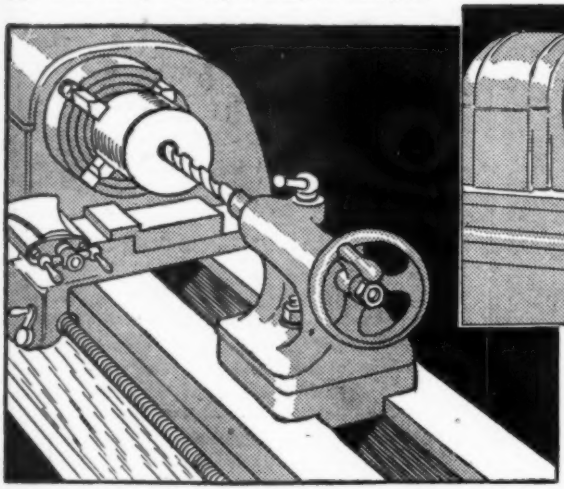
A DRILL chuck for use with center drills and twist drills up to one-half inch is a valuable accessory for any lathe. This adapter can be made for less than $1.50 and without any special tools other than those found in any workshop that has a lathe. An adapter that screws on the headstock is better than one that has a tapered shank and fits in the spindle because if the former turns, there is no possible damage, but the turning of a tapered adapter might score the spindle and cause the centers to run untrue, ruining the accuracy of the lathe.

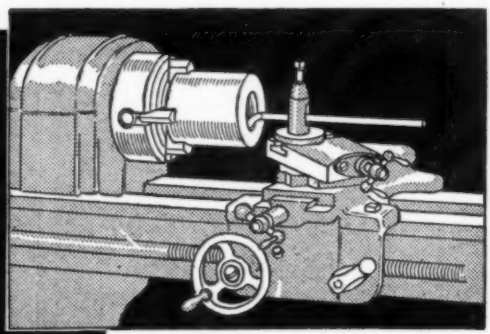
The adapter is made of free cutting Bessemer Screw Stock. A piece at least three inches long and two and one-half inches in diameter is necessary.

Mount the stock in a 4 jaw independent chuck and cut off or face to size. Then turn piece around and face the other side square. Use the lathe tool to spot the center so that it will be easier to drill the piece.



Cut bar stock to correct length before drilling and threading. Mount solidly in chuck, especially for cutting off.





When boring and threading mount boring bar or tool as short as possible to minimize chattering.

Drill out center hole with drill just smaller than minor diameter of thread to be used later.

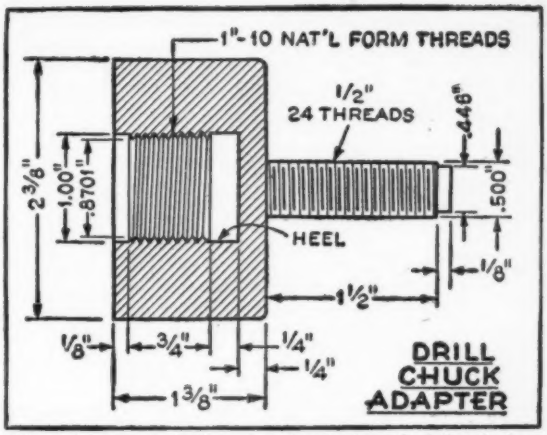
For Your Lathe

Use a small drill, about ¼ inch for the lead then enlarge the hole with the largest drill smaller than the minor diameter of the screw on the headstock. For an Atlas six inch lathe this dimension is .870 inches.

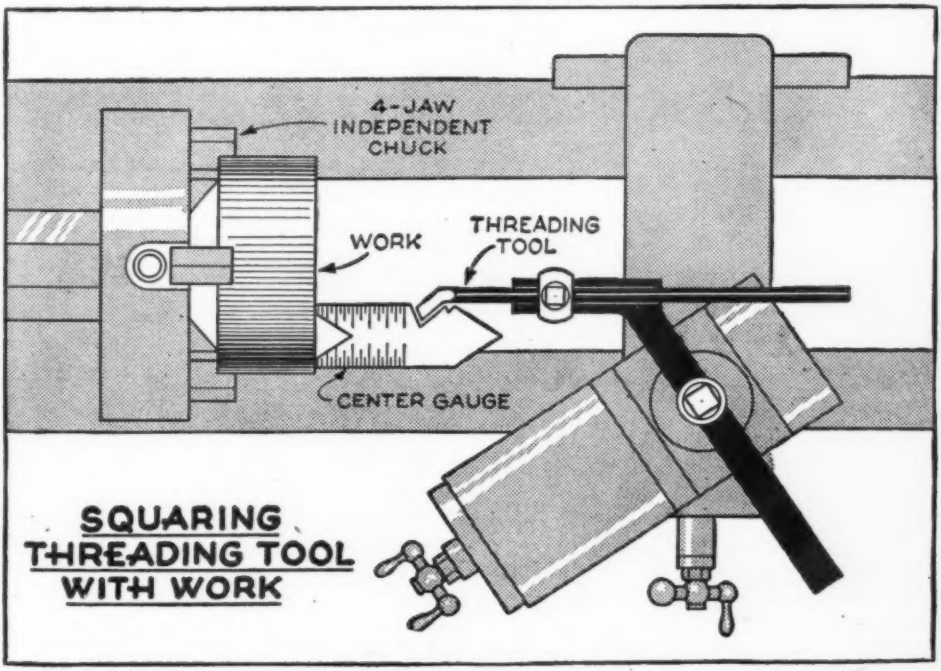
Bore the hole out to the finished *minor* diameter of the thread. Remember when boring that the work should be as tight as possible in the chuck and the boring bar should be as short as possible in order to minimize chattering. Be sure that the bar is on center and that there is sufficient clearance on the tool so that it cuts properly.

In order to keep the threading tool from jamming at the end of the blind hole, a heel, one inch in diameter, is machined at the bottom of the hole. It is also good practice to machine a small 1 inch diameter heel on the outside of the hole so that the threading tool will start easier.

The threading tool should be accurately ground to 60° and set exactly on center and perpendicular to the work. This is very necessary or the thread will not be perfect (see sketch). Be sure that the gear train is set for the proper number of threads per inch, and chase the thread at the slowest speed available. A chalk mark on the lathe bed will assist in knowing just when to stop the carriage. If the tool [*Continued on page* 174]

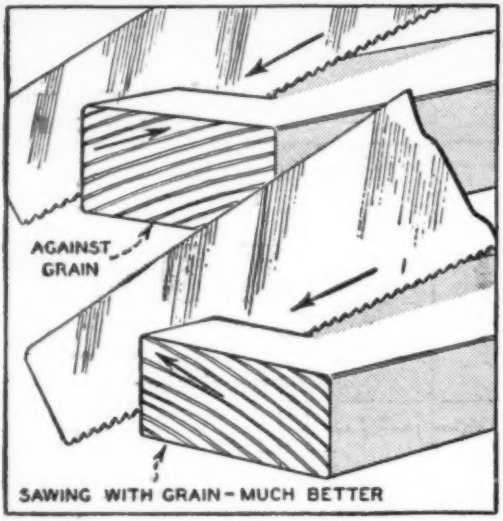


Atlas lathe original adapter was used on had standard threads shown



Threading tool must be carefully squared for smooth thread fit.

SHOP SHORTCUTS

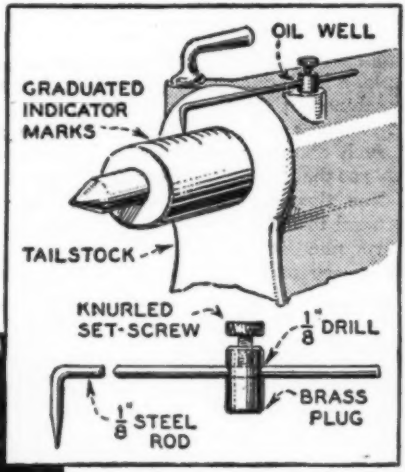


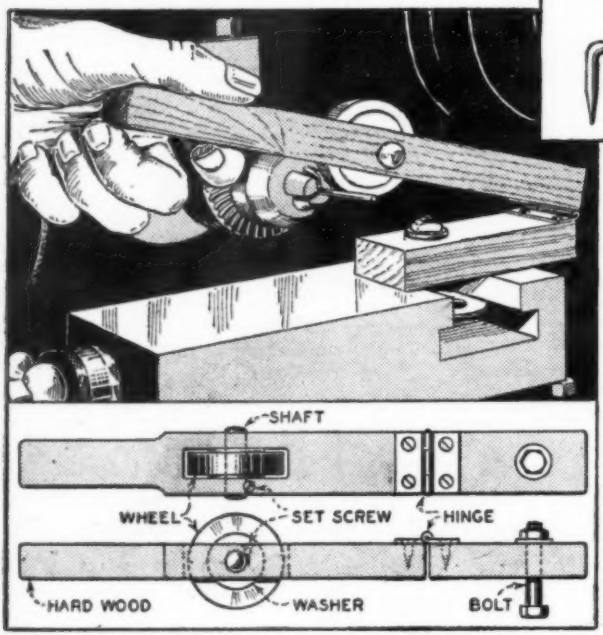
Saw With The Grain And Save Trouble

IT IS easier on both the saw and the workman if lumber is sawed with the grain instead of against it. The end views of the 2x4's shown illustrate the difference. "Feel" of saw also tells.

Lathe Drilling Depth Gauge

THIS tailstock travel indicator will help greatly in gauging the depth of holes drilled on the lathe. A plug is fitted into the oil hole on tailstock, with a set screw in the top. Set screw holds the ⅛" wire pointer where desired. Set pointer at zero when starting to drill, and pointer will show depth of hole.—*J. A. B.*



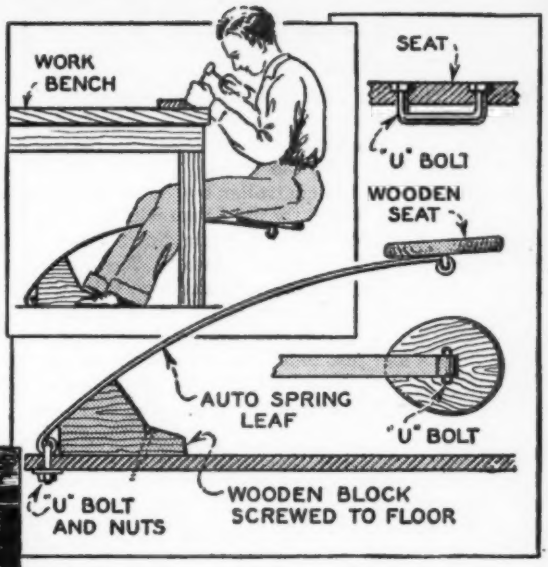


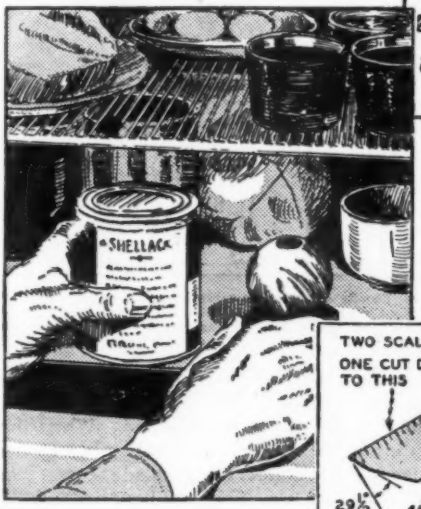
Straightening Bent Drills And Shafting

BENT rods and shafts are usually quite difficult to straighten, but this device simplifies the job. A piece of oak is slotted to take a small wheel with a flat rim. The shaft is held by a wood screw as shown. One end of the oak piece is hinged to another section that can be clamped to the tool post slot. As the bent drill or shaft turns in the chuck, the wheel is pressed against it, straightening it in a few seconds.—*W. E. B.*

Sit In Comfort At The Workbench

AN OLD auto spring leaf is the backbone of this comfortable workbench seat. One end of the spring is bolted through the floor by means of a U-bolt as shown. A wooden block screw-fastened beneath it at the floor end is cut to give the spring leaf the proper angle of inclination so that the seat itself will be at the correct height. The wooden seat is also held in place with a U-bolt. The nuts on the latter U-bolt should be countersunk into the wood of the seat, and covered with plastic wood.—*L. B. R.*



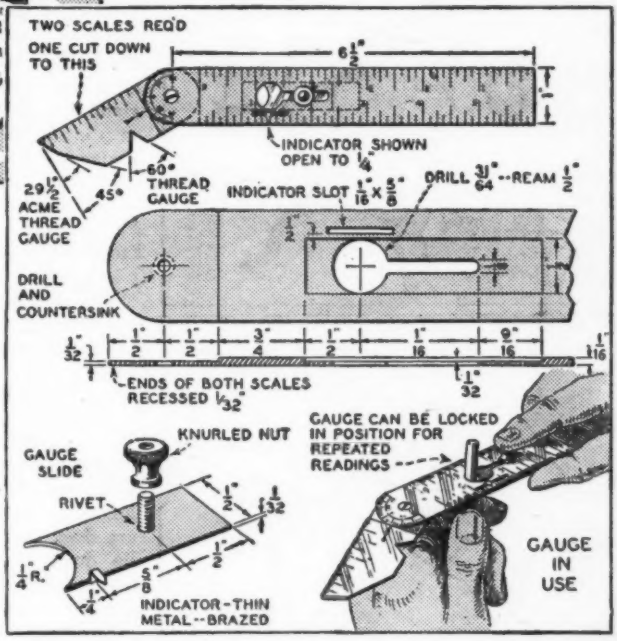


Chill The Shellac You Use

YOUR shellac finish will be greatly improved if you chill both the shellac and the article to be finished beforehand. For small objects, the icebox provides the answer. Cold shellac dries more slowly, gives more brushing time.—*B. N.*

Combination Gauge For Machinists

THIS combination machinist's gauge is a protractor, ruler, thread gauge, and drill diameter gauge. Scale may be purchased with radius on one end, which can be graduated in degrees. The arrow marked on the cut-off piece of a second machinist's rule tells degrees of any angle to be measured. The indicator pointer on the sliding gauge shown, tells the diameter of drills or rods placed in the circular opening.



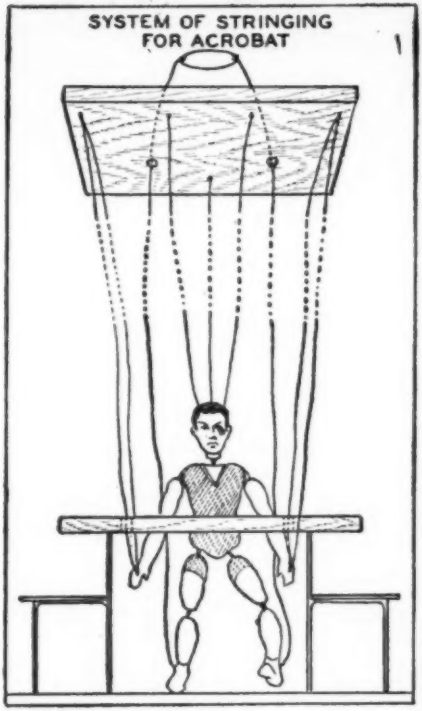
Lillipuppets

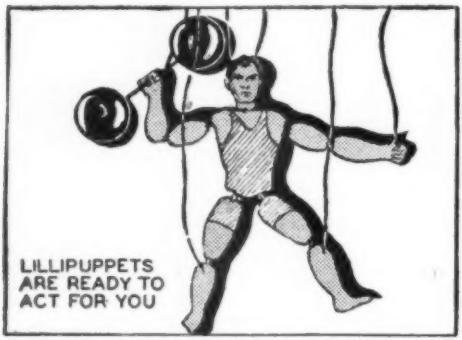
[*Continued from page* 101]

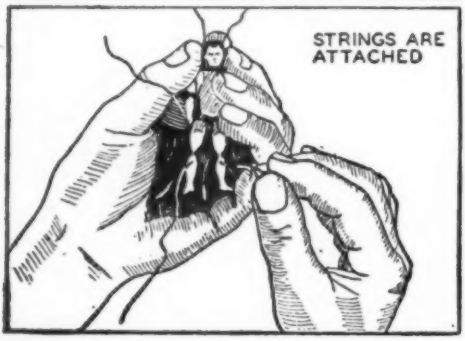
desired. The back string goes to the loop at the back of the controller. This should be just taut, so that tipping the controller forward will cause the figure to bow from the waist.

One hand holds the controller by the controller bar. By turning it slightly the figure will turn its head. Tipping it forward makes him bow. Rocking the controller bar makes him walk. The other hand manages the hand-strings, although this can be done with the forefinger of the hand holding the controller. Practice holding the controller so the puppet's feet just touch the floor of the stage. He can jump, but do not let him fly. And above all, do not let him sag at the knees unless your action calls for it. Get acquainted with the controller by working only one puppet at a time. Later you can learn to manipulate all necessary movements with one hand only, then you can work two Lillipuppets, one with each hand.

The controller as described will do for all standard characters, but can be varied for special actions. For example, the diagram shows a control adapted for a whirling dancer. In this case the controller bar has four loops instead of two. The hand strings are pulled taut so that the natural position has the hands slightly raised.







Above: Details of acrobat's controls (See July MI, page 104 for photo of this puppet). Chairs and cross-bar are made of light wood. *Left:* Threads are knotted and pushed into holes in puppet's limbs, where a drop of glue holds them securely.

When the controller is rocked, the dancer lifts an arm and a leg in unison. Also note that a rigid upper coil has been added. When the grip is shifted from the controller bar to the upper coil, the dancer can be made to spin like a whirling dervish. This is only one of infinite variations possible. If a particular puppet has a special task, analyze the necessary movements, and devise a controller to accomplish them.

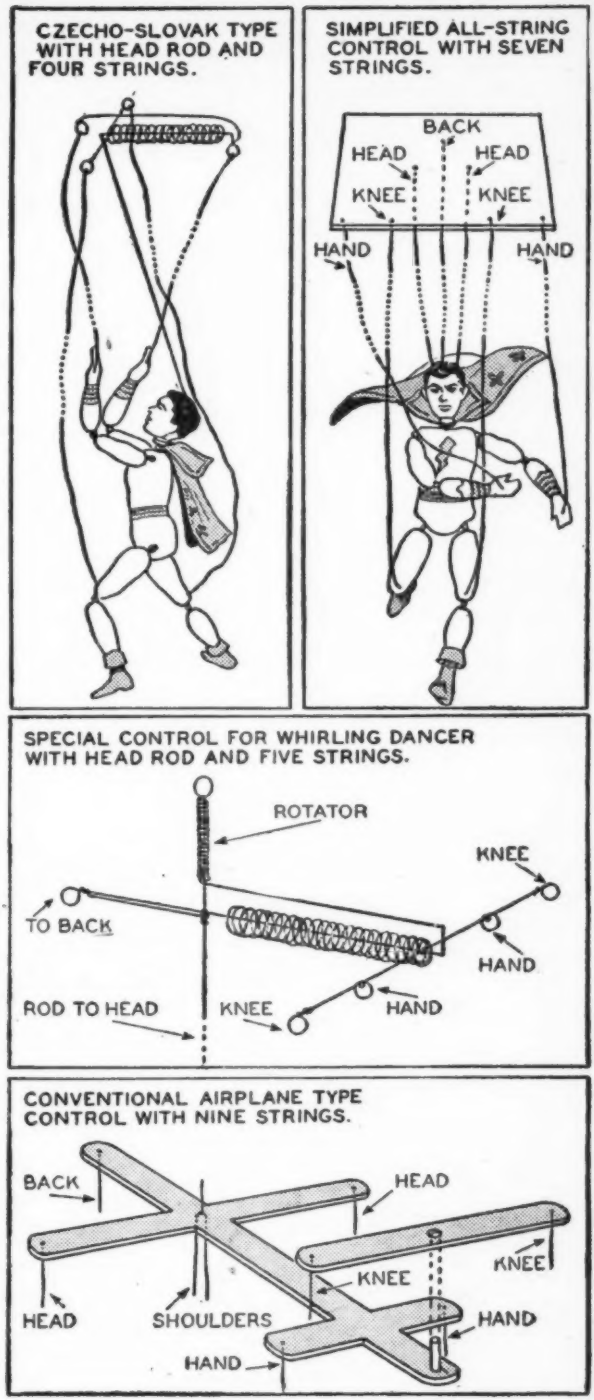
The controller with one wire to the head is recommended for use on as many of your Lillipuppets as possible. There are only a few strings needed, and these are unlikely to tangle, even if two or three figures happen to be laid down together. Storage of this type "between shows" is very easy. A good resting place is a short length of mailing tube with a bottom glued on, and perhaps a cardboard lid. The only actions which are impractical are deep bows, or the ability to let the figure lie down flat on the stage. Where these actions are necessary, then the more conventional type of control with more strings is suggested.

The conventional marionette is made just as previously described, but there is no wire leading up from the head. Seven strings are used, and fastened as follows: one to each side of the head, just above the ears; to each hand; to each upper leg just above the knee; and to the center of the back just below the shoulders.

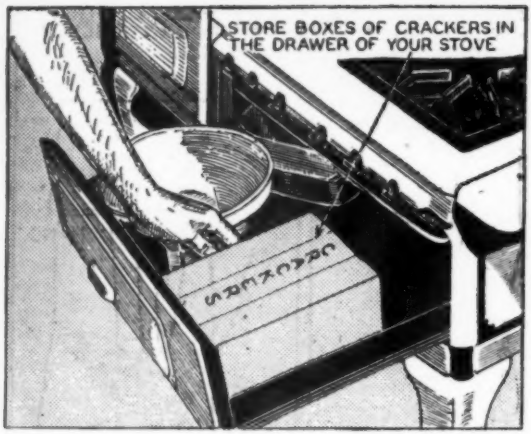
The simplified all-string controller is a piece of thick cardboard about two inches square, and the stringing is shown in the sketch. With a needle, run the threads through the controller at the points shown and fasten them. Space the controller so it is about five inches above the puppet's head. Adjust the head strings first, for the puppet hangs from these and should hang straight. Then tie the other strings so they are barely slack. Legs and hands should just hang straight down. The back string should be just snug, so that tipping the controller forward makes the puppet bow from the waist.

To make the puppet walk, just push the fingers against the leg strings alternately. This will make him lift each knee and take steps. The hand strings are within easy reach so the puppet may gesture. Great care should be taken with this type of puppet not to drop it, as he can become hopelessly tangled. For packing it is best to lay him out flat on a piece of cloth, and wrap him so that he cannot tangle.

For completeness, a sketch is given of the more-or-less standard air-plane type of controller, although this is unnecessarily complicated for Lillipuppets. However, if you wish to experiment, one can easily be cut from small pieces of lath. Note that there is a separate "walking bar," which when not in use is set over a pin at [*Continued on page* 164]



At top is a puppet of the famous Captain Marvel, flying cape and all. *Right:* Two types of control brackets, both simple and intended for one-hand operation.



HOUSEHOLD

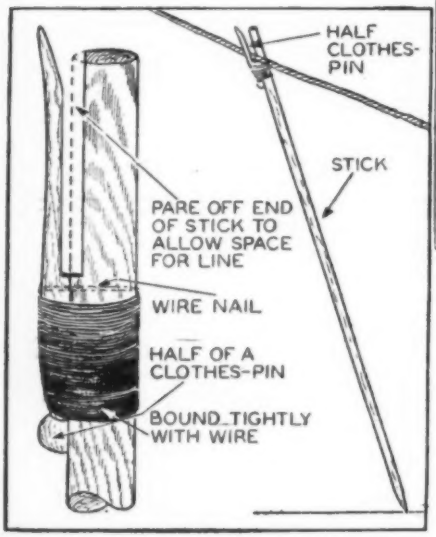
Keeping Crackers And Cereals Crisp

THE problem of keeping crackers and cereals crisp is easily solved as shown in the drawing at the left. Instead of using the drawer under the burners on your stove simply for the storage of pots and pans, it is a wise idea to leave room for cracker and cereal boxes too.—*B. N.*

Painting The Ceiling The Easiest Way

WHILE most amateur interior painters regard the ceiling as the hardest part of the job, it can be greatly simplified with this system. Divide the ceiling in half in each direction by means of a chalk line. Then sub-divide it with more chalk lines into 16 or more squares. Start painting in one corner, moving the ladder under each successive group of squares as they are painted.—*H. R.*

TAKE A PIECE OF CHALK AND MARK ACROSS THE CENTER OF THE CEILING FROM END TO END & THEN DIVIDE AGAIN BOTH WAYS INTO SIXTEEN OR MORE SQUARES



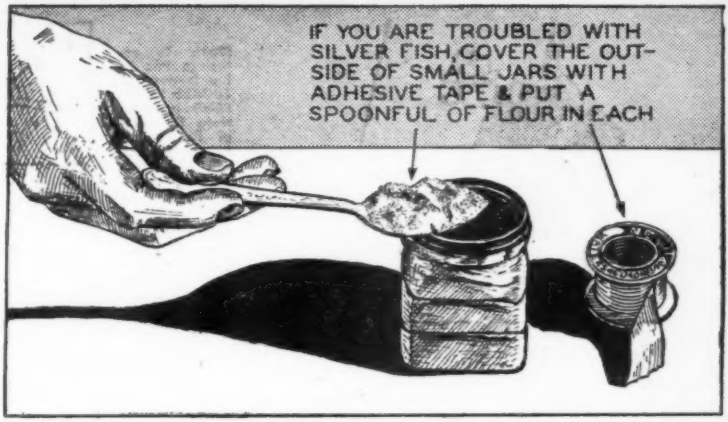
Clothes Props From Sticks

CLOTHES props can readily be made from scrap lumber by following the sketch at the left. The stick used may be either round or square, as it is pared off flat along the part where the half clothes-pin is bound and nailed on. Drill small holes through the half clothes-pin before nailing it so that it will not split. Bind it tightly with light wire or string, and shellac binding.—*L. B. R.*

AIDS

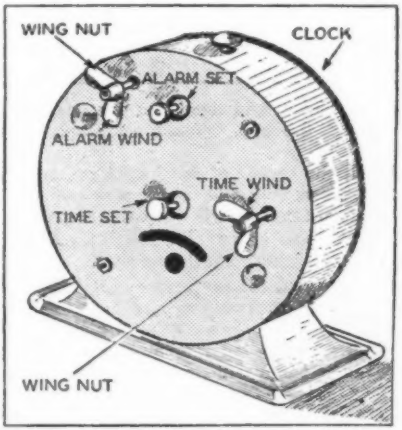
Silver Fish Nemesis

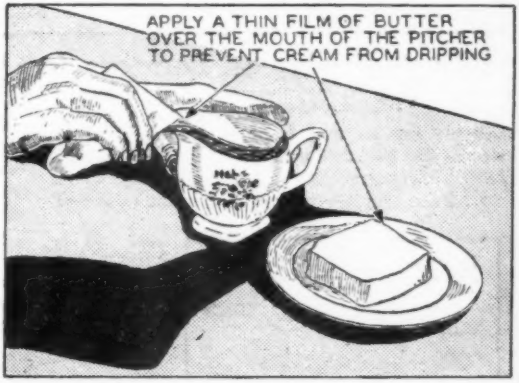
TO GET rid of silver fish, bind a small jar with tape so they can get in. A spoonful of flour will attract them in but they can't get out as inside glass is smooth.—*B. N.*

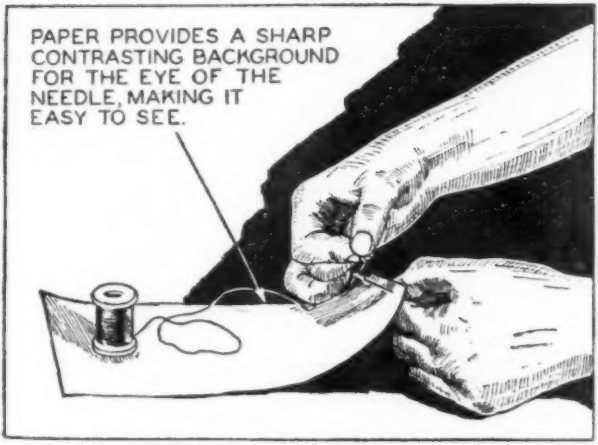


Handy Clock Winders

TO KEEP from breaking finger nails on clock winders that are close to set-knobs, solder wing-nuts to them, to extend them out from clock. —*H. N. E.*







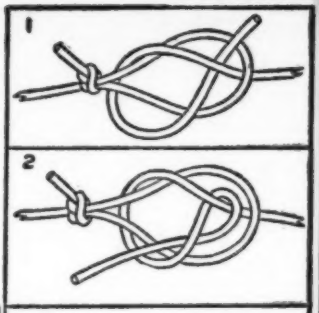
Trickle Trapper From Butterball

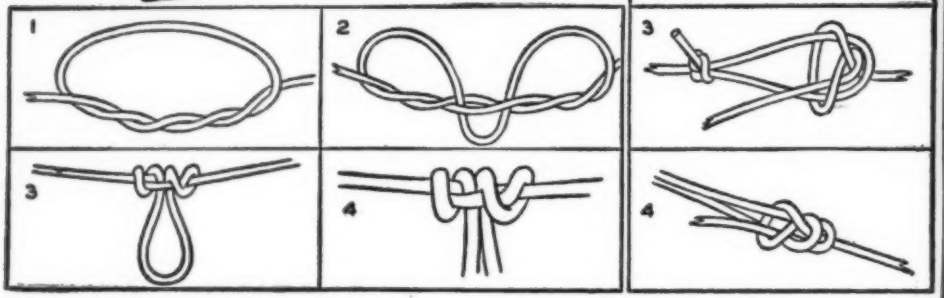
A THIN film of butter spread over the mouth of a pitcher as shown, will prevent cream from dripping on cloth.—*W. S.*

Needle Threading Made Trouble-free

NEEDLE threading is easier if needle is punched through white paper, contrasting the eye.—*W. S.*

Right: To attach a line to the leader the TUCKED SHEET BEND is ideal. Note that end of line points toward fly and will not catch leader in casting. *Below:* BLOOD DROPPER LOOP is useful when long leader holds several hooks or sinkers.





Knots For Nylon Leaders

[*Continued from page* 111]

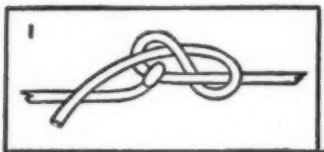
suitable for forming loops in leaders used in stream and lake fishing is the BLOOD DROPPER LOOP. It is one of the simplest Nylon knots to tie.

1. Tie a simple overhand knot in the middle of a length of leader, and then pass one end twice more through the loop, to make a multiple twist as shown.

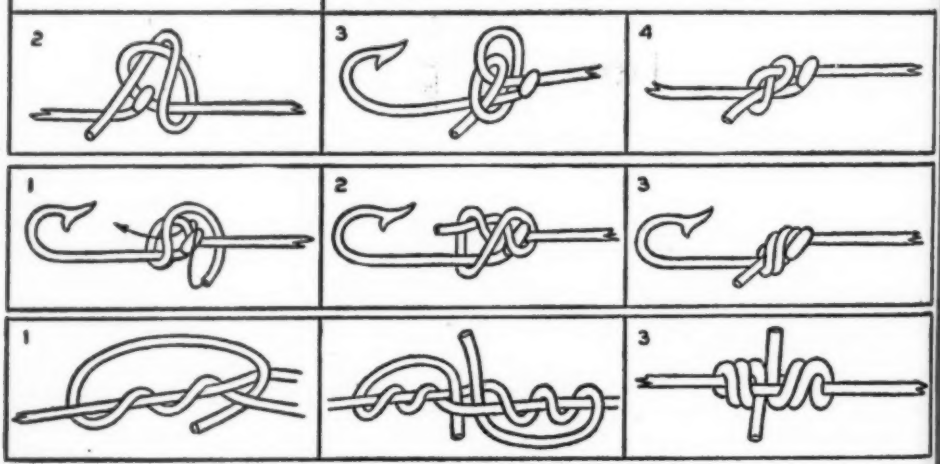
2. Pinch the center of the loop together and force it between the center of the series of turns. Small pliers or tweezers will make this step easier. Thrust your finger or a stick through the loop so it won't slip back through the turns.

3. Pull the ends of the leader outward. This causes the knot to draw up and lock the loop securely. The knot shown (No. 3 and 4) was made with a "three-twist" overhand as a start. Five twists or turns will produce a knot having

[*Continued on page* 172]



Below, top to bottom: FIGURE EIGHT, RETURN KNOT and BARREL or LEADER GUT KNOT, used for connecting two leaders.



IDEAS FOR SERVICE MEN

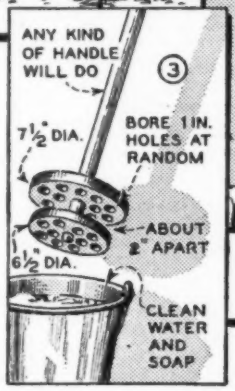
Soldiers, Sailors, or campers can use trouble savers below.

USED FOR SHREDDING SOAP, SCALING FISH ETC.
2
CUT NOTCHES WITH KNIFE EDGE FILE
1
PEEL BARK FROM LOG - SPACE 3FT. OR 4 FT. LONG
LOG SHOULD SLOPE TOWARD WATER

Less Work Washing Clothes

"Fear God, honor the Queen—
"Shoot straight, and *keep clean*"

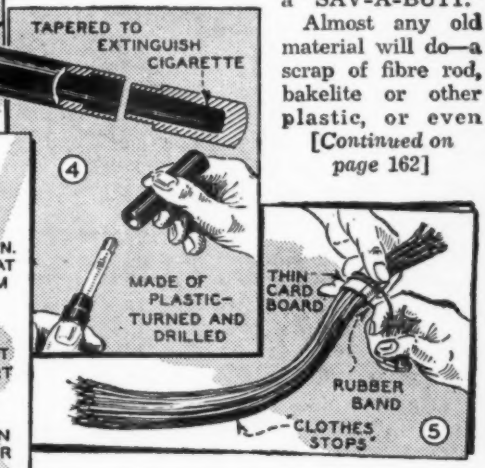
—slogan of the Scottish Highlanders, famous "Ladies of Hell" is a splendid motto for all outdoorsmen . . . with the last words probably not the least important. Motor tourists, hikers, campers, hunters and fishermen too often fall short of that cleanliness which is next to Godliness, not through intention or desire, but through ignorance of methods applicable to the exigencies of camp or trail. Immaculateness contributes largely [*Continued on page* 162]



Save That Cigarette

"WHAT a life!" says the Soldier, Sailor or Marine in the training camp, as he is forced to chuck his freshly lighted "gasper" into the butt bucket. It's a busy life the lads lead, and opportunities for a quick smoke are too often followed almost immediately by the unexpected command to "Fall in!" or the disheartening admonition of some sentry, "No smokin' in there, Mac!" Consequently the patriotic smoker finds himself buying two or three times as many ciggies as formerly—most of them finding their way into the butt buckets after a quick drag or two. So he wishes some friend with a lathe in his basement would get busy and turn him out a "SAV-A-BUTT."

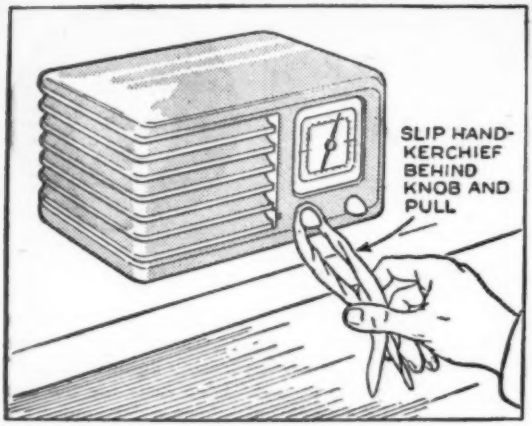
Almost any old material will do—a scrap of fibre rod, bakelite or other plastic, or even [*Continued on page* 162]



Don't Snarl Stops

"CLOTHES stops"—those 16" brass tipped three-strand cotton cords which all sailors use to fasten daily wash to the line, won't become snarled if kept this way. Bend a thin strip of cardboard around a bundle of stops, and make several turns of a rubber band around the cardboard (Fig. 5). Stops may be jerked out without fouling.—*C. B.*

RADIO

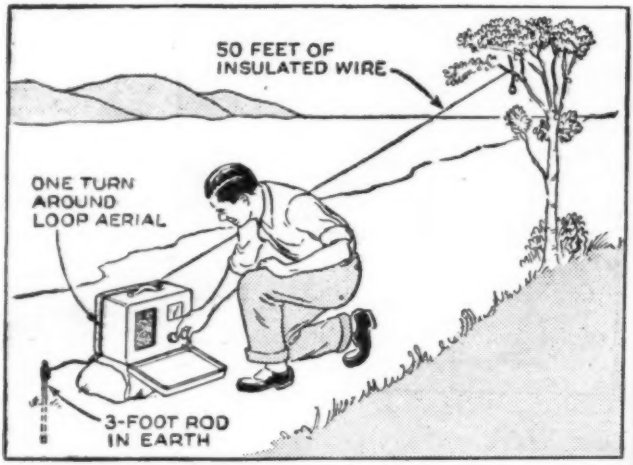


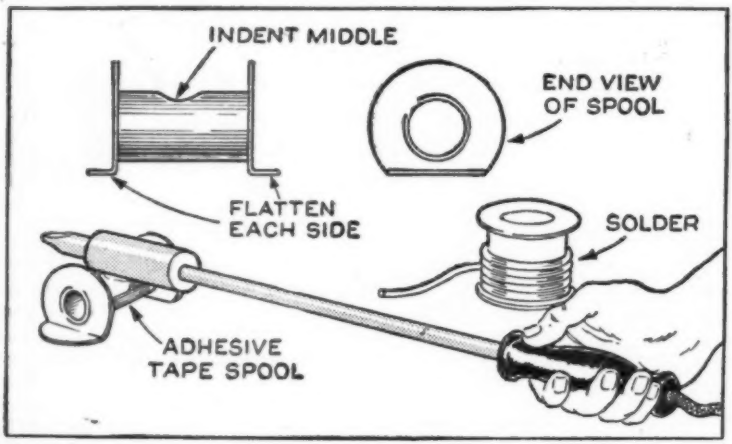
How To Remove A Dial Without Breakage

THE thin, plastic combination dials and knobs used on midget receivers cannot always be removed by pulling with the fingers. Prying with a screwdriver will do the trick—but usually break the knob, or chip the panel. A safer way is to slip a handkerchief behind the top of the dial, pull the ends down and cross them, then pull on the handkerchief. The even pressure exerted in this way removes the dial and prevents breakage.

More Volume With A Portable

WHEN a desired station is located fifty or more miles away, it may be brought in with additional volume if you have a 50-foot length of insulated wire in your baggage. Connect one end of the wire to a lightweight metal rod (about 3 ft. long) and drive this into the earth to serve as ground. Loop the wire once around the portable set, directly over its built-in loop aerial. Tie a small weight to the other end of the wire and toss this over a tree branch to get necessary height for the auxiliary aerial. This arrangement will bring the station in louder.





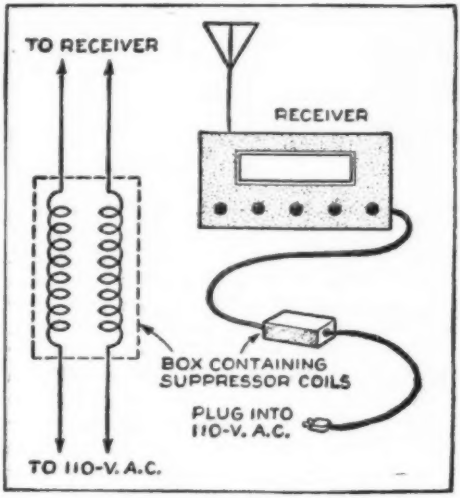
Metal Spool As Iron Holder

A METAL, adhesive spool makes a useful soldering iron holder. Merely flatten both sides of the spool so that it will stay put, and dent the rod a bit in the middle so that the iron will rest in it without slipping. It is a good idea to have three or four of these altered spools lying around on the electrical workbench.

SPARKS

Cutting Interference

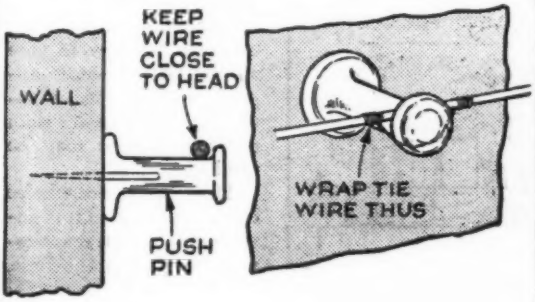
BROADCAST interference by amateur transmitters, especially on the lower amateur frequencies, has always been troublesome. One amateur has solved the problem on ten meters to his own satisfaction, as shown. It consists only of winding two coils to be inserted in series between the AC line and the broadcast receiver. Consisting of the proper number of turns, it effectively squelches the interfer- [*Continued on page* 160]

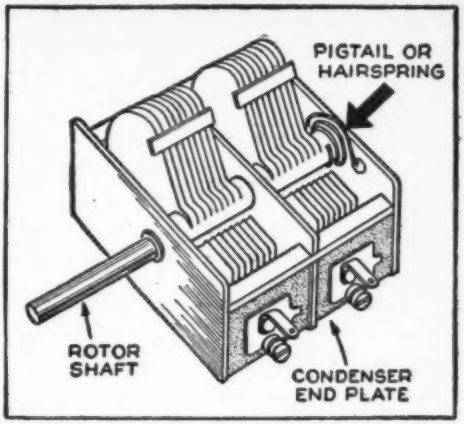


Push-Pin Insulators

PUSH-PINS having glass or molded plastic tops make attractive, efficient "stand-off" insulators for interior aerial connections, the high-voltage supply of receivers and small transmitters, etc. To hold wire in place, tie it to the heads of the pins with short pieces of the strands of old lamp cord.

The pins are especially useful in experimental rigs of the popular "breadboard" type because they are installed or removed in an instant.



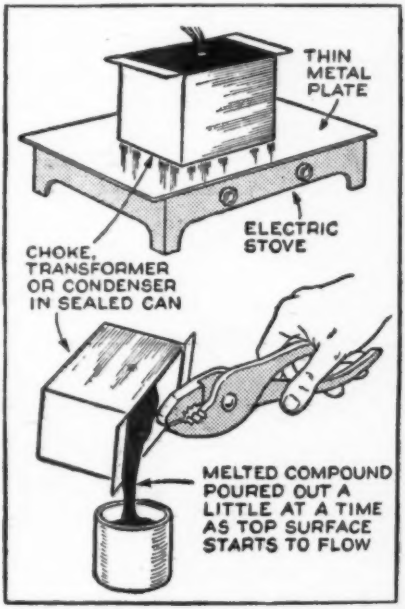


Kills Condenser Noise

THE noise generated by a tuning condenser when it is being rotated in a set is usually caused by dirty wiping contacts. Best remedy is the installation of a pigtail. Simply attach a short length of thin copper braiding to the rotor shaft, while the condenser plates are unmeshed; then wind up the pigtail by meshing the plates and secure the other end to the condenser frame.

Heating Sealing Compound

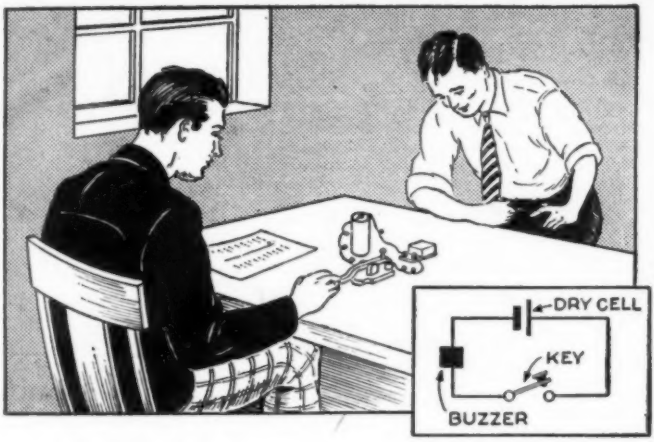
TO EFFECT a repair on a sealed unit it is necessary to first melt the tar-like impregnating compound. Place the can as shown below, and apply heat.


THIN METAL PLATE
ELECTRIC STOVE
CHOKE, TRANSFORMER OR CONDENSER IN SEALED CAN
MELTED COMPOUND POURED OUT A LITTLE AT A TIME AS TOP SURFACE STARTS TO FLOW

PROFESSIONAL TELEGRAPH KEY

by

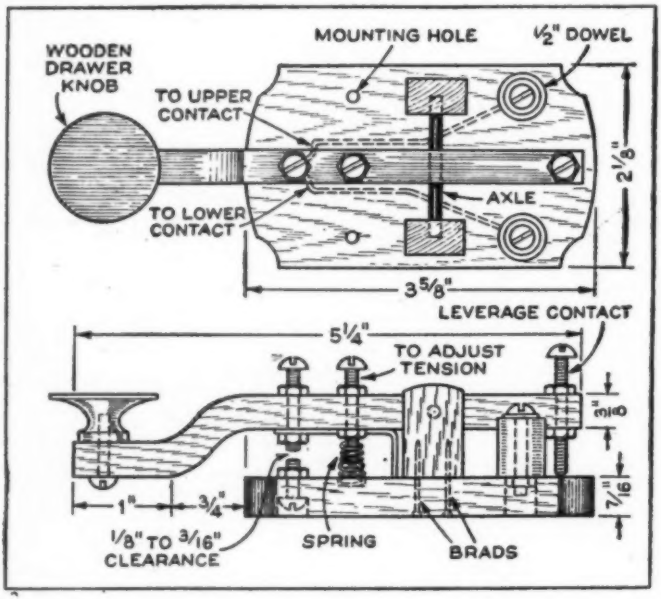
Frank Petraglia



THIS telegraph key is an identical reproduction of a regular commercial model used by radio operators. In all respects it is the same as the original with regard to size and operating adjustments. The metal original retails for several dollars, but this hard wood duplicate costs next to nothing. It is an ideal key for code-practice beginners. Licensed amateurs or commercial operators can use it, too, as a spare, for it may also be used to key any transmitter.

Using any hard wood, cut the base, of $\frac{7}{16}$" thickness, to 2⅛" by 3⅝". Notch out the decorative curves at the corner. To make the sending arm cut another piece, ⅜" thick, to ⅞" by 5¼". On this piece, draw the side view of the arm giving particular attention to the angle of curvature (as illustrated in detail), so that this angle occurs for ¾" of the second inch from the knob end.

Wooden dowels of ½" diameter and ⅝" height may be used for the binding posts. As the shape of these does not matter from the standpoint of operation, these posts may be cut square, if more convenient to do so. Similarly, cut two supporting posts to ⅜" by ⅝" by ⅞". For the axle, a large nail with ends removed, will be adequate. For the knob, wood or metal obtained for just a few cents at any hardware store will do. The knob diameter should not be less than 1⅛ inches.



With these parts completed, a few machine screws of suitable lengths, two pieces of ordinary bell wire, the key is ready for assembling. It is desirable, of course, to give the key some kind of finish and this is best done before the metal parts are added. Silver, gold or bronze paints have been used on this key to give an imitation-metal appearance, which is attractive. However, plain stain or pure shellac may be used also.

After the various holes have been drilled it is advisable to attach one supporting post to the base,

[*Continued on page* 174]

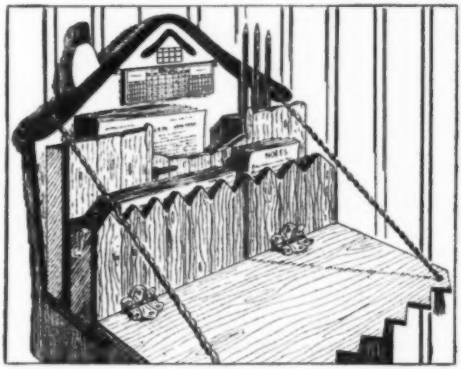
BUDGET DESK

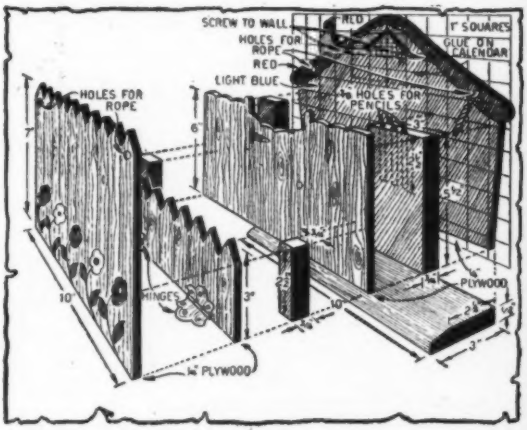
For The Kitchen Wall

by R. L. Fairall

A WALL desk is a handy kitchen accessory adding a touch of color as well as being very useful. Closed against the wall when not in use, and easily opened to form a small desk on which to jot down a note or grocery list. Space is provided for note paper, bills, receipts, and other papers as well as for three pencils.

The back, or house section, and the three fence sections are sawed from ¼" plywood, and the dividing sections including the one which holds the pencils, from ¾" stock. Three ⅜" holes 2½" deep are drilled in the 3x5½" section into which pencils may be set. The house and two fences are nailed together, as shown in the illustration, and the third or desk section attached by two hinges. The bottom section is sawed from ½" stock and the front ¾" beveled as much as it is desired to have the desk slant. Two holes are drilled in the desk section and two in the house section to accommodate the two ropes which hold the desk. The novelty is screwed to the wall and a penny calendar glued to the house as indicated. Paint the house light blue, the roof dark red, and the fences white. Paint red and yellow flowers on the under side of the desk, [*Continued on page* 176]





Left: Wall desk with writing panel extended. Circled sketch shows it folded. Pull-apart below shows the building details.

THE SCHOOL SHOP

Conducted by Frank Petraglia,

Shop Instructor, Samuel Gompers Industrial High School
New York City

Problems For Students

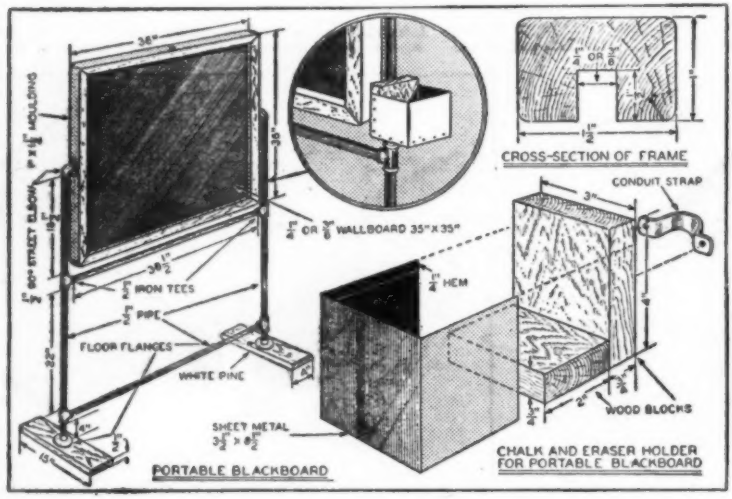
1. Q. "Is there some way of preventing the breakage of small wire bits when used in a drill press?"—K. B.
   A. Breakage is most often due to not using enough speed. If the drill press spindle is speeded up to its full capacity breakage will not occur.
2. Q. "What is a good material for school-book covers? I am particularly interested in using some transparent material so that titles will be visible."—S. R.
   A. A fairly heavy grade of oiled silk or Pliofilm will answer your purpose.
3. Q. "I have found that when the wooden grip on a hand drill loosens it is difficult to repair it. Is there some kink that can be used?"—H. F.
   A. Substitute a long stud for the short original one. Bore a hole clear through the handle, countersink the end, then drive the nut of the stud to pull the grip up tightly. This arrangement provides very firm support for the handle.
4. Q. "Is there some way of keeping small plans or blueprints free from soiling when in use at the workbench?"—C. B.
   A. Cut a square of plywood or thin board to convenient size. At one end, also cut a short tongue of several inches to act as a handle. Blueprints or other plans are then tacked to the board and need not be touched by the fingers as the board is held by the handle.
5. Q. "Recently I repaired parts of our porch floor and found that the flooring deteriorates because water seeps through the tongue and groove joints and soaks under the paint. What kind of waterproofing can be used here?"—R. L.
   A. By painting the tongues and grooves before nailing them this condition can be rather effectively overcome.
6. Q. "Can you indicate some kind of attachment which may be added to a drill to act as a depth gauge?"—H. O.
   A. Merely wrap a few turns of adhesive tape around the drill or bit to act as a marker.
7. Q. "What device may be used for holding a glass tube in a vise?" J. C. N.
   A. A block of wood, with a hole drilled through it and then sawed in half, makes a handy chuck for holding lengths of glass tubing in a vise. The hole should be of the same diameter as the tubing.

Portable School Blackboard

FOR the many school shops that do not have a convenient wall blackboard, the one described here will be a welcome addition.

The blackboard surface is made of a good grade of rigid wallboard, ¼"x3⅜" thick, 35x35 inches. The frame is made of white pine or other suitable wood. It is made as shown in the cross-section drawing, and the corners are mitered. This frame is glued to the wallboard and nailed with 1" brads at the corners. The smooth surface of the board is covered with blackboard paint. The other side is painted with flat white paint and is used as a screen for projecting motion pictures or slides or may be left plain and used as a bulletin board.

The corners of the blackboard frame should be carefully fitted, being either mitered or dowelled and glued. Otherwise loose corner joints might permit the frame to flex and warp the board when writing or drawing on it.

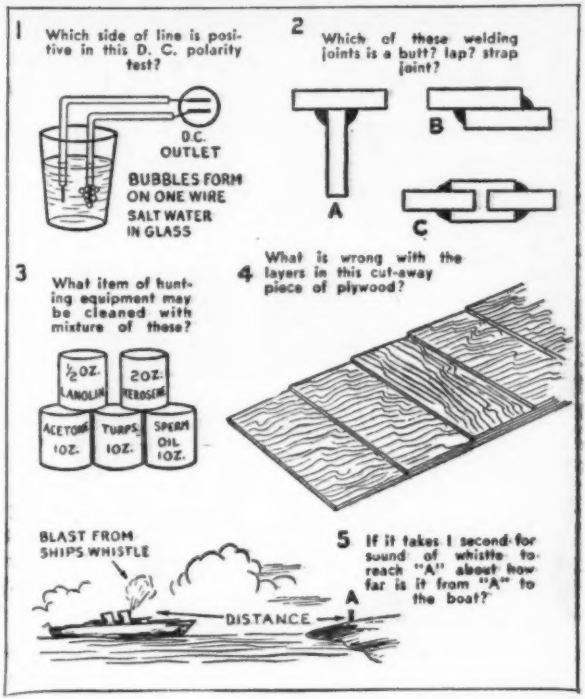


The materials required are:

1 piece ¼" or ⅜" wallboard, 35" x 35"
Moulding, 1" x 1½", 12' long
2 pieces 1½" x 4" x 15" white pine for base
2 pieces ½" pipe 38½" long
2 pieces ½" pipe 22" long
2 pieces ½" pipe 18½" long
2 pieces ½" pipe 4" long
4—½" malleable pattern toes
2—½" floor flanges
2—½" 90° street elbows
2—½" waste nuts
4 No. 8 F. H. wood screws ½" long
8 No. 8 F. H. wood screws 1¼" long

Flashes From The School Reporter

Reports from our various School Shop member-schools prove one thing very clearly—that the school-shoppers are right there in the forefront of those who are giving their time unstintingly in the war program. Everyone is either enrolled in the airplane model project, or assisting in their communities as air-raid wardens, or active in the "Get In The Scrap" campaign for salvaging scrap metals, rubber, etc. The boys are certainly doing their share like real troopers . . . This month we have a rather long list of new reporters to introduce to you . . . They are A. Steinberg, Bklyn. Tech H. S.; A. A. Kaliche, Shawano (Wisc.) H. S.; Edward Davis, Dobbins Voc., Phila.; Spencer B. Child, N. Davis Junior H. S. (Clearfield, Utah); Edgar Marookian, Palisades H. S. (N. J.); Tom Caputta, Cleveland Voc. H. S. (O.); Carmine Russo, Flushing H. S. (N. Y.); Richard Craig, Pinckneyville Junior H. S. (Ill.); Frederico Ruiz Bermudez, Ponce School, Ponce, Porto Rico. "M.G.E." reporting from Melrose H. S., New Munich, Minnesota, says that the Industrial Arts set-up there is such as to stir up any young mechanic's creative enthusiasm. All kinds of power tools are included in school equipment.


1 Which side of line is positive in this D. C. polarity test?
D.C. OUTLET
BUBBLES FORM ON ONE WIRE
SALT WATER IN GLASS
2 Which of these welding joints is a butt? lap? strap joint?
A
B
C
3 What item of hunting equipment may be cleaned with mixture of these?
½ OZ. LANOLIN
2 OZ. KEROSENE
ACETONE 1 OZ.
TURPS. 1 OZ.
SPERM OIL 1 OZ.
4 What is wrong with the layers in this cut-away piece of plywood?
BLAST FROM SHIPS WHISTLE
DISTANCE
A
5 If it takes 1 second for sound of whistle to reach "A" about how far is it from "A" to the boat?

HOW MANY OF THESE GENERAL QUESTIONS CAN YOU ANSWER?
See how well you can do on them, and if you can't get them all, turn to page 176 for the correct answers.

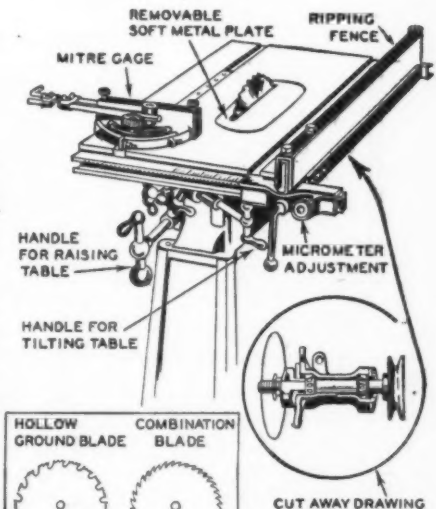
MI SHOP SCRAPBOOK INFORMATION SHEET

The Circular Saw

An extremely versatile machine tool, the Circular Saw performs, in addition to numerous regular sawing operations, such extra operations as edge planing, shaping of moldings, cutting of grooves, rabbets and tenons, and mortising. The standard Circular Saw, illustrated herewith, employs both a ripsaw and a crosscut saw, either of which can be adjusted and clamped at different heights above the table when desired.

The table consists of a large stationary metal platform over which the wood moves easily past the revolving saw blade. The movement past the saw is controlled by the operator. The teeth travel down where the wood enters. Fences or gauges for ripping, crosscutting, mitering and segment work are mounted as shown, and each makes possible the woodcutting operations for which it is particularly suited.

The cutting tools used on a circular saw are ripsaws, crosscut saws, miter saws, dado heads, and straight and shaped molding cutters. The teeth of circular ripsaws and crosscut saws resemble the corresponding handsaws. The miter saw, however, has about half dozen crosscut teeth alternating with a ripsaw tooth around its circumference. A dado head consists of two saws or outside cutters, and a number of inside cutters of various thicknesses which may be placed between these. Grooves from ⅛ to 2 in. can be cut with a dado head.



THE ART OF DAMASKEENING

Finish metal objects in your own workshop with these beautiful, shining designs.

by Clyde Baker

THE polished pattern of tiny circles so often seen on plane surfaces of fine tools, dies, jigs and fixtures, as well as on rifle bolts, exposed surfaces of automatic pistol barrels, etc., may be produced in many ways.

The rubber abrasive sticks, which have sharp, fast cutting abrasive compound bonded in soft rubber, and which are available through the Chicago Wheel & Mfg. Company, and the Weldon Roberts Rubber Company of Newark, N. J., are excellent for this work. But there are other ways, if this material is not readily available.

Many home shop mechanics are proud possessors of some sort of hand grinding tool—such as the Handee Grinder, the Moto Tool, the Duro Hand Grinder (available in two sizes) and several excellent hand grinders available through the mail order houses.

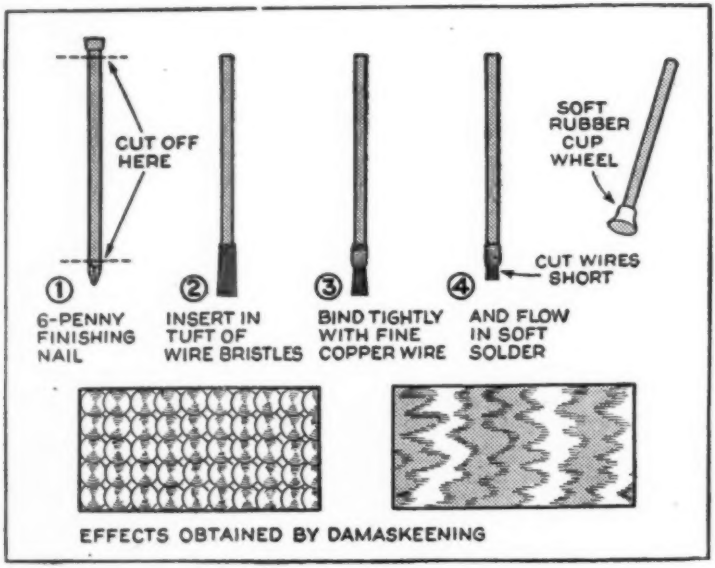
Every one of these tools carries as part of its equipment, a small stiff bristled brush. A similar brush for heavier work, may be made as shown in the drawing, by binding on and soldering a tuft of bristles from a wire scratch brush (obtainable at the "dime store") to a shank made of $\frac{3}{32}$" drill rod.

And, your dentist, or a local dental supply firm, can provide you with the soft rubber cup wheel.

Drawing at top shows a convenient method of damaskeening bright parts in the drill press. The same procedure is applicable whether you use the rubber abrasive sticks, the bristle or wire brushes, or the dentists' soft rubber cup wheels.

The work is first coated liberally with any good abrasive paste such as emery and oil, aluminous oxide and oil, or a standard automotive valve grinding

[*Continued on page* 176]


CUT OFF HERE
SOFT RUBBER CUP WHEEL
CUT WIRES SHORT
① 6-PENNY FINISHING NAIL
② INSERT IN TUFT OF WIRE BRISTLES
③ BIND TIGHTLY WITH FINE COPPER WIRE
④ AND FLOW IN SOFT SOLDER
EFFECTS OBTAINED BY DAMASKEENING

Left: Two types of easily-made tools for use in the drill press to damaskeen polished surfaces, and samples of the results.

[*Continued from page* 11]

Corporation. Application for this patent was made in pre-war days.

In the Nallinger invention, the auxiliary surfaces may be added either to the tips or trailing edges of the wings, or they may even be extra wings. They are held in place by means of notched rods, fitting into sockets and held with pawls. After take-off, the pawls are released, springs thrust the rods out of the sockets, and the auxiliary parts drop away and float back to earth on small parachutes.

* * *

Camera To Record Bombings

An automatic camera to record the effects of bombings is protected by patent 2,283,788, issued to Ambrosius Briechle of Brooklyn, Roy T. Hurley of Dobbs Ferry, N. Y., and George E. Merritt of Lusby, Md., assignors to the Bendix Aviation Corporation. Their machine has adjustments which automatically allow for all the motions of the plane and keep the lens aimed at where the bombs actually fall, so that the success of a raid can be judged by the most coldly impersonal data. Another use for the camera, the inventors state, is in practice bombing, doing away with the expense and bother of actually loading and dropping bombs.

* * *

Rocket-Turbine Engine

A propulsion device combining rocket and turbine principles is the invention of Ernest Achterman of Westfield, N. J., on which he received patent 2,283,863. Mr. Achterman proposes to burn a mixture of gasoline and liquid oxygen in an elongated, strong-walled chamber, permitting the heated combustion gases to roar rocket-wise through an opening at the rear. On the way out, however, they are expected to turn a spirally formed rotor, which is geared to a propeller forward.

Thirty years ago Admiral Bradley Fiske obtained a patent, No. 1,032,394, for a "Method of and Apparatus for Delivering Submarine Torpedoes From Airships." At that time the invention was considered as impractical and as having only "slight" possibilities. Subsequent events have shown very convincingly how practical the weapon can be. Fiske had the vision to appreciate that the torpedo carrying plane could be even more effective than a battleship. So another inventor had to wait years to have his beliefs vindicated.

* * *

What are some of the proposals that have been made for defense and offense? There is a magnetic device for drawing submarines out of their course to the side of a ship carrying the magnet. Was the inventor satisfied merely with capturing the sub? No, for upon contact of the submarine with the magnet, a terrific shock would sweep through the sub and its crew.

Then there is the persevering torpedo, which, if it misses its objective on the first trip simply turns around and attacks the target from another angle. This invention comes from no "crackpot" inventor. The holder of the patent is John Hays Hammond, Jr., who has hundreds of patents.

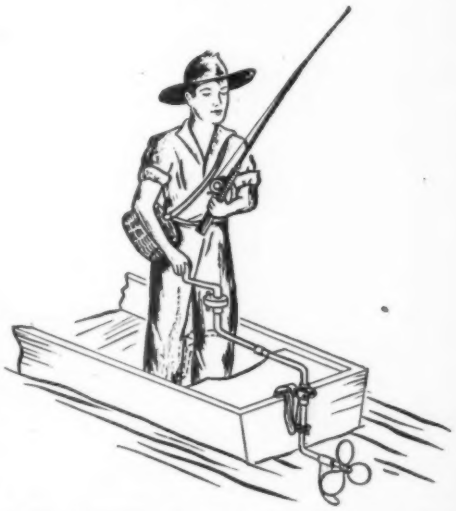
We might speculate as to the effectiveness of the Hammond torpedo against a ship designed by another inventor. This inventor suggests the use of fast moving endless steel belts around the hull of a vessel. The speeding belt would throw off a torpedo before damage could be done.

The belt idea bears a relation to the large spinning screens proposed by another inventor. These rotating screens atop a building are for the purpose of brushing falling bombs aside.

* * *

If it can be shown that an invention has been in public use in this country for more than one year prior to the time of filing an application for patent, the Patent Office will refuse to grant a patent. If the article upon which a patent is sought has been on sale in the United States for more than a year before an application is filed, that, also, is grounds for denying a patent.

* * *



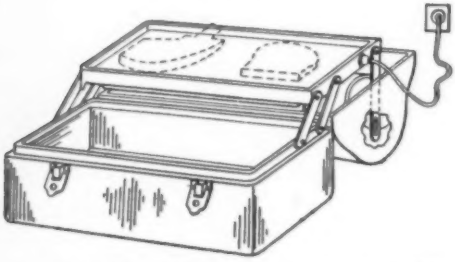
For the purpose of propelling and maneuvering a boat while casting or fishing, John Bevington, of Cleveland, Ohio, has designed a novel attachment for small boats. The propelling unit attaches to the stern board of a boat in the same manner as an outboard motor. The propeller is

New Products And Inventions

[*Continued from page* 147]

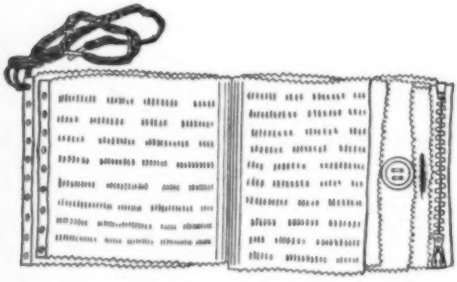
moved by a hand crank which can be manipulated from either a sitting or standing position. By a pull upon the operating handle to either side it is possible to steer the boat. (No. 2,273,815.)

* * *



A combination lunch kit and electric griddle won a patent for Frank Walker, of Los Angeles. The griddle, or hot plate, contains an electric heating coil having contacts for an electric cord. The griddle is adapted to swing up to be used when the cover of the kit is raised. The plate is suitable for frying, grilling, broiling, toasting, or otherwise heating foods. (No. 2,274,285.)

* * *



For teaching children how to dress, Nancy Grace, of Ithan, Pennsylvania, has designed an amusing type of book. The book includes a number of sheets on which an interesting story is printed. The sheets are fastened at their ends by a variety of fastening devices, such as buttons, laces, zippers, or the like. For example there may be sheets of sweater fabric attached by a zipper. The printed story tells the child what the fastenings are and how to use them. As the story progresses from page to page, there appear pictures of various articles of clothing and the use of the fasteners with these articles. The references to the articles being progressive so as to interest the child first in one and then in another fastener in the desired order, teach the child how to dress and undress himself. In the use of the zipper, to illustrate the unfastening of pajamas, for example, the successful use of the zipper is necessary before the story can be continued. (No. 2,275,956.)

"Blinker" Aids Landing

Using shifting shadows on the ground, cast by alternately blinking lights shining obliquely from the wing-tips, is the method for detecting obstacles on unknown landing terrain recommended in U.S. patent 2,282,356, just granted to a South African inventor, Jacob A. Hellmuth of Bloemfontein, Orange Free State.

A pilot coming down for an emergency landing after his flares have been used up cannot depend on what straight-forward landing-light beams show him, Mr. Hellmuth explains, especially if obstacles are of the same color as the ground, like trees against a grassy meadow. But if the lights are set "cross-eyed" and blinked alternately at a rate of from one to three times a second for each light, the shadows falling first right, then left, will give plain warning of any obstacle.

* * *

Clover-Leaf Parachute

Steadier, slower parachute landings are promised through the use of a parachute with an over-all outline resembling a three-leaved clover, on which patent 2,282,407 was issued to E. L. Hoffman and J. M. Russell of San Diego, Calif. They claim that their design eliminates the pendulum-like oscillation that is such an annoying feature of descents with ordinary circular parachutes, and that slower drop is inherent in the steadier descent. They claim also that their parachute is less likely to foul on opening.

A new way of opening parachutes is the basis of patent 2,282,234, obtained by Charles A. Minich

[*Continued on page* 150]

BRING ON THE

GAS RATIONING!

This month the nation, or at the very least residents of the eastern seaboard, will go on permanent gas rationing. None of MI's able readers need worry about it, however, for two reasons, both of which will be found in the September issue, out August 5th.

Reason 1: The How-To-Build Section will feature a constructional article on two types of economical midget cars, or "buck-boards," both powered with little air-cooled engines that will run for hours on the smell from gas pumps it passes.

Reason 2: Another article will tell how you can *easily* and *cheaply* convert your present car to run on 9c-per-gal.-fuel oil (unrationed) no matter what make or year it may be. Don't miss this! *September MI.*

BUILD FROM BLUEPRINTS

If you're planning to build a model, boat or other project, you'll find the work greatly facilitated, time saved, and the chances of expensive mistakes reduced by the use of large scale blueprints. The plans listed on this page are genuine, professional-type blueprints on heavy, durable paper with ample margins for notations, etc. Order by number, enclosing check or money order, and address FAWCETT PUBLICATIONS, INC., GREENWICH, CONN. For convenience, use the coupon below. *No Canadian orders.*

BOAT: *Ella Mae*, shown below, is a 17 ft. outboard cruiser that's easy to build and needs no fancy lumber—just plain, cheap wood will do. She has a sleeping cabin for two, is V-bottomed, and will push along at a good clip with a 3 H.P. outboard motor (no gas ration card needed). *Blueprint No. 968, price $2.00.*

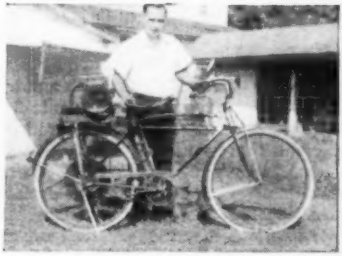
MODEL: Build an accurate scale model of one of the U. S. Navy's "T" Class submarines, pictured below. Plans include full-sized templates for hull. *Blueprint No. 336, Price $1.50.*

BOAT: Above you see *Flying Fisherman* living up to her name. Just under 12 ft. long, of plywood construction, she'll take any outboard from 1 to 20 H.P. *No. 967, $1.50.*

MODEL, right: Speed king of the model airways, *Yellow Jacket*, guide-line gas powered model monoplane. *Blueprint No. 329, $1.50.*

MODEL, below: Here's an action model that will give any boat model fan the thrill of a lifetime. You guessed it—a 26-in. model PT motor torpedo boat like the one Lt. Bulkeley smashed the Japs with. Completely detailed and powered with a midget gas engine. *Blueprint No. 330, Price $2.50.*

MOTOR BIKE, right: The answer to rubber and gas rationing. If you own a bicycle you can install a small motor that will push you comfortably along on practically no gas! Plans show two types of installation, and include a bike sidecar. *Blueprint No. H-82, Price $1.00.*



ADDITIONAL BLUEPRINTS:

Bonnie, 18 ft. plywood auxiliary sloop. Beam, 7 ft., sail area 160 sq. ft. *Blueprint No. 944, $3.00. Full-sized patterns for above, No. 944A, $2.00. Full-sized body plan, No. 944B, $2.50. All three, special $7.00.*

Poco Dinero, Hanna designed 20 ft. auxiliary. *No. 975, $4.00.*

Little Mae Too, Moth Class sailboat, 11 ft. long. Fast, simple, safe little craft. *Blueprint No. 983, $2.00.*

Nor'wester, Alaskan type kayak, 15' 6" long, light and strong. *Blueprint No. 966, 75c.*

SPECIAL: Complete blueprints, including full-sized body patterns, for building the U. S. ARMY M-3 TANK MODEL are available at $2.00, *Blueprint No. 337.*

SEND YOUR ORDER TODAY

FAWCETT PUBLICATIONS, INC.
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Enclosed is $.....for which send me the following blueprints, postpaid (order by number).....

Name .....

Street & No. .....

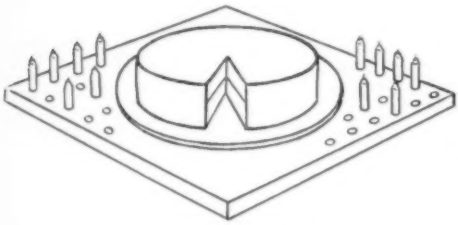
City & State .....

New Products And Inventions

[*Continued from page* 148]

of Philadelphia. Instead of the customary small pilot parachute, which pops out of the pack first, pulling the main chute after it, Mr. Minich's device depends for opening on a tubular sleeve extending vertically from the bottom of the rig to near the top of the chute, its ends kept open by stiff rings. This directs a stream of air through the parachute, and makes opening not only sure but less abrupt than is the case with present parachutes, the inventor claims.

* * *



No more melting candles dripping onto a birthday cake if the cake plate invented by Mary Nicol, of Detroit, is used. The new plate includes a dish portion upon which a cake can be rotatably mounted. Around the cake there is a projecting portion provided with a number of candle sockets. The burning candles form a border for the cake, and no cutting or serving can be done until the candles are all extinguished (No. 2,274,499.)

* * *

Man-Powered Glider

A new attempt to achieve man-power flight, a dream as old as Leonardo da Vinci, is represented in patent 2,282,669, granted to Stephen Miller of New York City. Mr. Miller does not claim, however, that his craft can be flown by human muscle-power alone; it is a glider, with a pair of auxiliary propellers to help the pilot get into favorable sustaining currents, and also a geared rear wheel to assist in taking off.

The glider pilot rests on his chest, in a partly prone position, using his hands entirely for steering. His shoulders are set against solid braces, enabling him to use his strongest muscles, those of his back and legs, in driving a pair of pedals like those of a bicycle. Suitable shafts, gears and chains transmit the power to propellers and take-off wheel.

* * *

Anti-Aircraft Gun Mount

Among new warlike inventions is a base for anti-aircraft machine guns or light cannon, the offering of John W. Poysa of Los Angeles for patent 2,282,742. It is a mounting suitable for use on the deck of a ship, the roof of a building or the bed of a truck.

It consists of a strong but light hollow pedestal, with seat and footrests for the gunner, enabling him to shift around with his gun without taking his eye from the sight. Handwheels enable him to change elevation rapidly and to raise or lower the level of the whole gun, and a brake makes it possible to lock the piece in any position to insure greater steadiness during firing.

* * *

Improvement In Retreading

Better retreads—a matter of more than ordinary interest for tire users nowadays—are promised through patent 2,282,579, issued to Paul E. Hawkinson of Minneapolis. Mr. Hawkinson's process is stated to be an improvement over the present practice in what is known as the kettle curing method of retreading tires, in which the tire, with its newly applied retread, is steamed under pressure in a locked kettle.

Essential part of the new method is spreading the beads of the worn tire as far as possible, thus compressing the tread portion. The retread is then applied and the tire, still expanded, is put through the "cure" in the pressure kettle. When the beads are released and return to normal position, the tread portion is stretched, and the retread kept under the right degree of tension to give best wear.

* * *

Double-Barreled Inner Tubes

A "double-barreled" arrangement of twin inner tubes is the contribution to the solving of the nation's tire problems on which Guillermo Austria of Los Angeles received patent 2,282,598. The inner tubes, each of semi-circular cross-section in the vertical aspect, lie side by side in the tire. Each has its independent inflation valve. If either is punctured, the other immediately expands to fill the entire casing and enables the driver to move along to the next free-air station without ruining his tire.

GOIN' FISHIN'?

OR HUNTIN'?

If you are, and you probably are, better spend a couple of days first curled up with the September MECHANIX ILLUSTRATED. Why? Because there'll be articles in it that you won't want to let get away from you, like the "big one" of song and fable. How to make decoys, for instance, that really fool the ducks as well as the hunters . . . or how to carve result-getting bass plugs from slices of old broom handle . . . ideas for improving your gun, and hints on keeping it in good shape. Don't forget, *September MI!*

Could You Identify These in a Raid?

THESE are silhouettes of German military planes such as might raid the U. S. Drawn to scale, they are: fighters—1) Messerschmitt ME 109; 2) Heinkel HE 112; 3) ME 110. Dive bomber—4) Junkers JU 878. Army cooperation—5) Henschel HS 126. Bombers—6) Junkers JU 88K; 7) Dornier DO 17; 8) Dornier DO 215; 9) Junkers JU 86K; 10) Heinkel HE 11 K MK111; 11) Heinkel HE 111 K MK. VA.

Transocean Panzer Units

[*Continued from page 63*]

propelled attacking and armored mounts for 105 mm. or 155 mm. guns, reconnaissance units, supply trucks as well as a full company of Marines. The armament of the vessel itself includes 2 powerful guns in revolving turrets and 4 triple anti-aircraft units.

In the tentative design of this ocean ferry, consideration has been taken of the building and construction problem. It can be built with many standard parts, machinery and materials. Another important feature is the varied uses that this craft may be assigned to. The central way is designed with movable doors or bulkheads making it devoid of any obstacles the entire central length of the vessel. In this manner a row of landing barges, or a row of torpedo boats, can be rolled on tracks directly out to sea through the stern trap door. The main bulkheads are longitudinal, and independent engine rooms are provided on the starboard and port sides. Double stern, double rudders give complete clearance for the stern trap doors. A multiple crane permits the retrieving of barges and torpedo boats, and the loading of rolling materials can be accomplished speedily much in the same manner as the loading of passenger vehicles on a ferry boat.

This ship could be utilized as a tanker, freighter, repair ship or a mother ship. The vessel could carry planes, completely assembled except for the wings, which would do away with present methods of crating and assembling. Its varied other features make this a perfect auxiliary war craft.

If a force of 100 of these assault ferries could be assembled at a base on our west coast, we could land on any point in Germany, Holland, Norway, France or Italy with maximum chances for success.

Addition To Sun's Family Predicted

A NEW planet about the size of Pluto but a little less distant may be added to the sun's family, which already contains nine members.

No such tenth member has yet been found, but the attraction of such a body would account for the three days' delay in the return of Halley's comet in 1910, according to the calculations of Dr. R. S. Richardson of Mt. Wilson Observatory. And he has told astronomers just where to look for the new body. It should now be found, he says, at about right ascension 16 hours, declination minus 20 degrees.

At first, Dr. Richardson thought Pluto might be the culprit that held back Halley's comet. But Pluto was miles away at the time—in fact, more than three billion miles away. This was the closest the planet ever got to the comet, and it happened in October, 1901. Also Pluto is tiny, only as big as the earth! Finally, Dr. Richardson's calculations showed that if Pluto had any effect at all, it was in the opposite direction; it would have hastened rather than delayed the comet.

What is needed to explain the comet's dilatory behavior, Dr. Richardson found, is a planet whose orbit just grazes the furthermost tip of Halley's orbit, grazes it by about 9,000,000 miles. The planet would be about the size of Pluto or the earth. A large planet at a greater distance would also do the trick. But the planet must be small because otherwise it would have been discovered.

If this planet is found, it will be the third to have been predicted mathematically and afterwards discovered. The other two are Neptune, discovered in 1846 from the calculations of Leverrier and Adams, and Pluto, discovered in 1930 from the calculations of Lowell and Pickering.

A "Two-Bit" Paradise for YOU

Did you ever dream of a languorous South Seas lagoon, filled with native Dorothy Lamours, where you could spend your life in tropical ease under swaying palm trees? Have you always thought that such a place existed only in day dreams or Hollywood movies? Then, brother, you're all wrong!

Captain Charles Borden, for ten years skipper of a South Seas trading sloop, tells you exactly where such a place exists, how you can get to this paradise—and how you can live there for as little as $6 a month! It's all to be found in a swell adventure article by Captain Borden in next month's MECHANIX ILLUSTRATED, plus many other features you won't want to miss in this big summertime issue! Out August 5th.

Captain Charles Borden and friends, in Paradise.

Now—Power From Sunlight!

[*Continued from page 49*]

into electrical energy, it promises a grid of such cells across the entire country.

As the sun rises off the Maine coast a little after 4:00 a. m. in mid-June until it sets off the California coast something after 11:00 p. m., Maine Eastern Standard Time that day, sunlight-electricity may turn our machines or accumulate in vast storage batteries which will illuminate our nights.

Keep The Old Bus Rolling!

[*Continued from page 51*]

No Need To Doubt

Dragging brakes are expensive in terms of lining, tires and gas, so don't be in doubt about this condition. If a brake drum is free it will offer a ringing sound when tapped with a hammer, but if it shows drag there'll be merely a dull thud.

Blowing Bubbles

A simple idea that may save you having the battery rebuilt is to avoid forming bubbles in the acid solution when testing the car's battery by the hydrometer method. When the battery heats up the bubbles disappear and the electrolyte level may fall below the tops of the plates.

This Weapon Could End War

[*Continued from page 57*]

But there is still another wonder to the tank itself. As it hurtles along the ground—faster than any other tank the world has ever known, its crew need not resort to hand signals as a means of directing their actions—the airplane tank runs with so little noise that its occupants can actually talk to each other. But that is all that can be told until the war is won.

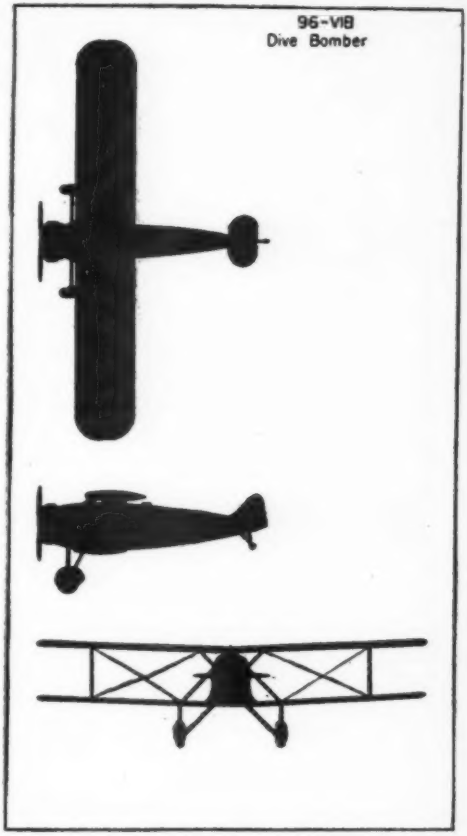
THE JAPS SAY . . .

***"One day we shall fight against America."*—Baron Giichi Tanaka, former Jap Premier, speaking in 1927!**

AMERICANS SAY . . .

. . . by those words, Baron Tanaka admits the Japs were preparing for this fight years ago! Let's show him how useless their preparations were—by buying War Bonds and Stamps *now* and making them wish they'd never heard of America.

Looks Like Spad But It's Not One

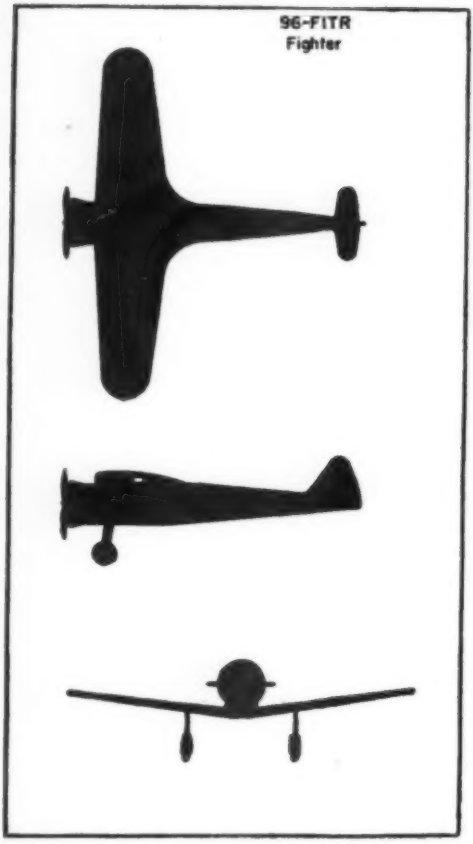


EXCEPT for its slight negative stagger, this Japanese dive bomber might be taken for a 1918 Spad. About the only other modernization of design included on the ship is the split-type landing gear and the wheel pants. The outer struts of the landing gear are braced by members running at an angle from the top of the lower wing to the top of the fuselage structure.

A cowling is used around the radial engine to improve cooling and to reduce resistance. As in many other ships built in Japan, the tail surfaces are unusually small. The trailing edge of the top wing is provided with a semi-circular notch at the center to provide better visibility for the pilot and also to permit easy exit from the cockpit.

The speed of the ship is relatively low, limiting its use to unprotected objectives. Ships of older types such as this one, while formerly used against the Chinese in certain areas, are of little value against any objectives today, as they are easy prey for Allied Nations' planes.

Low Wing Fighter By The Japanese



THIS single-seat low wing fighter is used by both the Japanese Army and Navy. Not unlike many other Japanese airplanes, it has an unusually small tail area in proportion to the wing area. The rudder area, however, is considerably greater in relation to the wing than is the area of the horizontal tail. This would effect some improvement in spin characteristics.

The purpose of the small tail is doubtless the sensitivity of control which it affords when other aerodynamic factors and also balance are correct. Experience proves, however, that the tail area should be somewhat greater in proportion to that of the wing, than is common in Japanese engineering practice. Newer ships of that nation show some increase in tail area. The small diameter propeller is another Japanese design characteristic being altered. While the horsepower of the ship has not been revealed, Japan's aircraft are comparatively low powered.

By Air To Alaska

[*Continued from page* 39]

the chain of airports has assumed military importance to the United States and Canada vastly greater than even the foresighted members of the joint defense board envisioned during the recent days when our only foe was commonly considered European. They planned it as a defense measure enabling the quick concentration of men and planes in the Alaskan peninsula in case of an attack on that portion of the North American continent nearest to Asia. Today the airway's facilities and advantages are especially appreciated as American sentiment wings from defense thoughts to attack convictions.

The chain of fields makes it possible for men and aircraft to be mustered in Alaska from all over the United States and Canada within 24 hours! Thence they can strike south against Japan's close-packed nation in an avenging sweep of bombers. Military experts already see Alaska thus playing a role of such significance as had not even aroused speculation a few months ago. It looks as if Canada's $6,000,000 investment in costs of the airports will be repaid a thousandfold in war strategy alone!

Fighter planes' short range prevented their flying to Alaska before the new fields were built. Now the United States can move a squadron of them from the Canadian border to Fairbanks in slightly more than five hours' flying time. Troop-carrying transports can fly soldiers over the same distance in about eight hours.

The inland route escapes the heavy fog which often blankets the coast, passing over the "clear weather country." Furthermore, the airway is being well equipped with radio beam stations and other aids to navigation. Only the terrific blizzards of northern Canada's midwinter will make the skyway's air and ground forces yield.

While the airfields' importance to our war strategy comprises the overwhelming interest of the route at present, still the effort which went into reaching the sites of the landing fields with construction equipment, and the leveling of woodland, make up a saga of backbreaking and heartbreaking labor not often matched since pioneer days. Behind the band of hardy men who tackled the job are the planners in the air services branch of Canada's department of transport who deserve much credit for foreseeing for several years the importance of this route of possible airport sites.

The plans called for main ports at Grande Prairie, Fort St. John, Fort Nelson, Watson Lake, and White Horse—the last-named being the final jump-off from Canadian territory into Alaska, where Fairbanks is the main terminus. As shown on our map, these points make a neat chain across the wilderness. Grande Prairie, to which planes would fly from established fields in southern Canada or from U. S. airfields near the border, and Fort St. John were near enough to railways to eliminate the transportation problem. White

[*Continued on next page*]

By Air To Alaska

[*Continued from preceding page*]

Horse, at the other end, was also fairly close to railroads, but Fort Nelson was 300 miles north of the end of steel and Watson Lake was just a pencil point on the planners' map, utterly surrounded by wilderness. Watson Lake presented most problems and labor to the men seeking it though it was part of the summer campaign.

Bound for Fort Nelson, Tractor Train No. 1 started out from Dawson Creek in two sections on February 9, 1941. In the front was a bulldozer as a trail-breaker. Following this was a small tractor hauling several cabooses—wooden huts on sleighs containing a combination kitchen and dining room, a staff quarters, and two bunkhouses for the crew of 28 men. Drawing up behind this section was another consisting of a blacksmith's shop and five sleighloads of heavy freight, hauled by a caterpillar.

As mile by mile the caravan bunted and battled its way through the wilderness, sometimes it moved ten miles in 24 hours, but more often managed only three or four miles. A week after its departure it had covered 35 miles.

As further difficulty, the spring break-up was earlier than in many years. Time and time again the heavy tractor crashed through thin ice, had to be laboriously hauled out inches at a time by all manner of ingenious tricks.

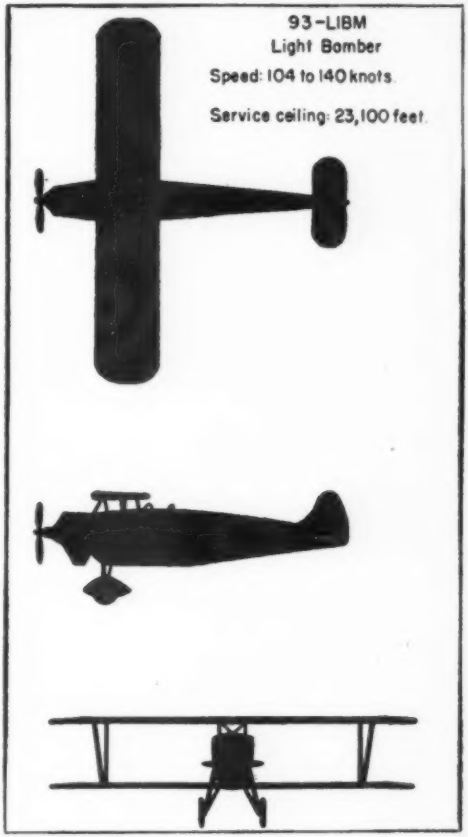
This first tractor train, leaving a trail which others might follow, arrived at Fort Nelson on March 31, 1941, and flashed the news of its arrival by a small wireless transmitter installed in one of the cabooses. The entire journey, truly a battle with nature, had taken 48 days.

Next came the summer campaign. To hew a road into Watson Lake in one summer, over rocks and muskeg bogs, was out of the question. The problem was solved by floating in men and equipment from Wrangel, Alaska, via the Stikine and Dease rivers. This involved 350 miles of river travel, plus a 75-mile portage. Trucks, tractors, grading machinery, and equipment for two saw mills constituted some of the equipment floated in on barges.

After a river journey of 165 miles, the equipment was unloaded at Telegraph Creek and work started on the 75 miles of road to Dease Lake. When this had been finished, a shipyard was set up at the end of the portage. Here power boats and barges were built for the final run up the Dease river.

At the end of this stretch there was another and shorter portage and then the last water trip across Watson Lake to the airport site—400 miles from Wrangel. On the shores of Watson Lake a saw mill was built. Here the men cut their lumber and built their houses, boats and roads like modern Robinson Crusoes. Now they can fly on to Alaska or to the States in hours totaling a fraction of the number of days they spent reaching the places to chop out mighty links in our wartime and postwar aviation strength.

Our Fighters Have Triple The Speed



THIS Japanese light bomber belongs to a vanishing type of war plane. With a speed of approximately 150 miles an hour, it is no match for the faster monoplanes. About the only biplane in use by the United Nations during the recent stages of the war is the British "Swordfish" torpedo plane.

The ceiling of this Japanese specimen is 23,000 feet—about half that of our high altitude ships. Like the early Wright and Curtiss ships, this one has upper and lower wings of equal length. While the silhouette shows no interplane bracing aside from the struts, proper strength is undoubtedly attained through streamlined brace wires.

Wheel pants reminiscent of 1935 and thereabouts, complete the streamlining of the ship. Although the upper wing is raised above the fuselage far enough to permit the pilot to see under it, it creates a large blind spot. The landing gear has a narrow tread.

The Art Of Japanese Warfare

[*Continued from page 38*]

respect are their little three-ton, two-man tankettes, originally designed for them by Vickers in Great Britain.

In place of the usual heavier type rifles, their landing parties carry a toylike, peculiar-looking little gas operated automatic. It fires only .25 caliber bullets and only thirty shots at a loading, but it has proved surprisingly effective against the heavier arms of United Nations soldiers. And, more important, the lightness of both gun and ammunition enables the Nip to carry a much greater supply of cartridges.

Each move is preceded by thorough preparation. When the zero hour arrives the officers already know every foot of the terrain. The mechanized troops and aircraft are ready to support infantry action and often enemy morale has already been undermined by espionage and treachery.

Bold, sneaking and fiendishly clever, vanguard "Japandos" almost always attack from the rear in the most unexpected and impossible places. In night attacks, moving stealthily and silently forward in crouched position, often they crawl until within actual leaping distance, placing great confidence on surprise and its resultant advantage of momentary confusion to their enemy. Such powerful United Nations centers as Penang, Rangoon, Singapore and Surabaya all were successfully attacked by such rear guard infiltration methods plus swift flanking movements.

To illustrate the extreme contrast, whereas 50,000 to 80,000 pounds are required to transport, equip and supply one single United Nations soldier, the Japanese equipment is carried on the back of each soldier and consists of arms, ammunition and a sack of food containing 24 hours' emergency rations plus five days' supply of rice. Two bowls per man, one for rice and one for tea, plus two chopsticks, eliminate stoves and other heavy, cumbersome camp cooking apparatus and supplies. No cooking staff is required, since each man does his own cooking and prepares his day's food over but one fire daily. Rice and salt form each soldier's basic supplies and for any and all desserts and extras he depends wholly on the invaded country. Under normal conditions the average meal consists of a bowl of rice, raw fish, vegetables and a bowl of tea, with occasionally some seaweed for salad.

Any form of alcoholic beverage is strictly forbidden for all except ranking officers, who may have a liberal supply of saki (rice wine) with their meals and otherwise at their pleasure. The one striking exception to this rule is the fact that Jap officers invariably permit their troops to go on sprees of drunkenness and rape after each victory. The Jap foot soldier drunk is not a pretty animal to see.

One Japanese prisoner, a university graduate and less sullen and taciturn than the rest, told me that all of Japan's special invasion troops must be A1 athletes, masters of jiu-jitsu, adept at jumping, climbing, swimming and crouch running. He neglected to add that they are masters of the most effective sneak methods and experts in killing instantly and silently.

Perhaps the most horrible single fact about the Jap army is that the soldiers are systematically brutalized by being taught to behead coolie captives or use them as living targets for bayonet practice. The Jap is taught that it is manly to "blood" his sword or bayonet, and he is hardened to it by practice on helpless captives.

Ninety-five per cent wear leather shoes only when in uniform, for, being long accustomed to native sandals, their unusually large ape-like toe spread makes shoes an aching and often unbearable proposition. When taken prisoner they eagerly exchange their leather shoes for native sandals or slippers.

Fanatical in their blind devotion to Buddha and to Emperor Hirohito, whom they believe to be the direct descendant of the Sun Goddess, the Japanese soldier places great faith in good luck symbols and charms to protect him against the enemy. Often on their guns and rifles we found tiny white flags with rising suns in the center and stowed away in their pockets larger flags with hundreds of signatures. Before leaving for battle they solicit signatures first from their friends and acquaintances and later from strangers in railway stations, etc.

Most widely used and most popular among the various good luck symbols is a Buddhist charm belt of a thousand stitches called "sennin-bari" and worn religiously and with great faith by each soldier as a charm against bullets. Of heavy white cotton cloth darned with French-knot stitches into large red dragons and various battle symbols, a "sennin-bari" is a foot wide and four feet long and is carried wrapped around the body next to the skin. I first saw them back in 1937 in Osaka, Japan, where the women's auxiliary of the Jap-

THE JAPS SAY . . .

***"I shall not be content merely to capture Guam and the Philippines and occupy Hawaii and San Francisco. I am looking forward to dictating peace terms to the United States in the White House at Washington."*—Admiral Isoroku Yamamoto.**

AMERICANS SAY . . .

Are we going to stand for this? If not, the only way to prevent it is to buy those War Bonds and Stamps—and buy 'em and buy 'em!

Let's go, America!

anese Red Cross stood on street corners and in railway stations and department stores soliciting stitches for the belts from passersby. A young girl is allowed to put in only one stitch but a woman fifty years of age or over is allowed to put in three. To be successful each belt must have been stitched by at least 4,000 different people, they believe.

Although their good training and discipline often shows up well on the battlefield, they become readily drunk with success and in turn arrogant, cruel and ruthless to all conquered peoples. Celebrating a minor victory over the Chinese Army I have seen Japanese soldiers after drinking but two pints of beer defy and insult their own officers.

Looking at him solely from the credit side of the ledger, the Japanese soldier might easily appear to be the answer to a militarist's mid-summer night's dream. Such, however, is far from being the case. In the first place Japs are too robot-like in battle and, though efficient tools, are utterly lacking in initiative and are almost never brilliant or quick-witted. Though trained in blind obedience and utterly possessed by intense native pride, they cannot stand defeat and on occasions of distinct reverses strong measures have to be taken to control hara-kiri or spectacular suicide.

Fortunately, America has for long had one man who was thoroughly aware of these facts and long ago began using them to the best possible advantage. Yes! It's that man again, General Douglas MacArthur. Previously other generals when confronted with a Japanese infiltration rear guard surprise attack ordered their men to turn on the invaders with generally a costly battle and loss of territory. On the Bataan Peninsula, MacArthur's highly successful technique was to allow the invaders to infiltrate and then use a detachment of shock troops to cut them off and surround them, while reserves proceeded to slaughter them at their leisure until the main body surrendered.

MacArthur, in other words, realized an amazingly simple fact: that the Japanese style of fighting is nothing more or less than old-style frontier Indian fighting! It's a style of fighting that baffled the English generals at Hong Kong, Singapore, etc. But it's a style of fighting that's plain meat for Americans—for every American has practiced Indian fighting since he was old enough to hold a wooden gun.

MacArthur realized that the Japs wanted to play "Cowboys and Indians!" He played it with them—with a vengeance! So, tough and cunning, individual and independent as the Jap soldier is, he's in for some tough going when he runs up against real American "cowboys" equipped with real American guns!

HOW GOOD A SCIENTIST ARE YOU?

Here is a test that probably shows nothing about your scientific ability. It may show something about how closely you read the current news of science, and how well you remember it. At any rate, if you get more than 8 right you shouldn't be wasting your time with quizzes—you're a genius. If you get 6 out of 10, you are better than most; and if your score is less than 5—well, it's all in fun anyway. The idea is to pick the answer you believe comes closest to the truth. The answers are at the bottom of this page.

(Courtesy Westinghouse Research Laboratories)

1. In a cubic centimeter of air the number of molecules is about (A) 10,000; (B) 10 quintillion; (C) 10 million.
2. Grenz rays are (A) bactericidal ultraviolet radiations; (B) long-wave X rays; (C) cosmic rays.
3. Astronomers recently discovered that the sun is (A) 1 million; (B) 750,000; (C) 100,000 miles farther from the earth than they previously thought.
4. A virus is (A) a vaccine for hog cholera; (B) a disease-producing organic molecule; (C) a new kind of vitamin that promotes growth.
5. Sulfathiazol is (A) a medicine; (B) a poison gas; (C) a photographic developer.
6. Neutrinos are (A) natives of the prehistoric island of Neutrin; (B) hypothetical subatomic particles; (C) medicines that neutralize excessive body acid.
7. If you had a piece of string 1 astronomical unit long, it would be (A) 1,000 miles; (B) 1 meter; (C) 93 million miles long.
8. The universal standard of length is (A) the meter; (B) the light year; (C) the wave length of the spectral emission of cadmium.
9. A 1,000-pound aerial bomb falls approximately (A) 10 times; (B) same speed; (C) 16.1 times as fast as a 100-pound bomb.
10. Velocity of light is (A) same; (B) 20 times; (C) 200 times that of sound.

Answers to Science Quiz:
1B; 2B; 3C; 4B; 5A; 6B; 7C; 8C; 9B; 10C.

Model M-3 Army Tank

[*Continued from page* 119]

In between each of the sprockets the clutch is loosely keyed to the shaft and is made up of 3/16" diameter rod with a groove cut into the center to allow a pin on the shifting lever to move it from one side to the other.

This engages only one sprocket, driving the tank in a sharp circle. When the wheel on the control box is turned the magnet snaps the bar over and the square pin engages the thread which produces the great leverage needed to move the shifting lever. When the magnet releases the bar snaps out of the thread and the shifting lever goes back into neutral where it engages both sprockets together, driving the tank in a straight line.

The clutch actuating lever is detailed in the drawings. As can be seen this lever is pivoted to a cross brace on the chassis and has at one end a projecting dog or prong which rides in the clutch collar. At the opposite end this lever is tied to the chassis' sides with small tension return springs. Just aft of the pivot point the lever is equipped with a pivoted cross bar which has at each extremity a flat metal bar projecting downwards. These projecting bars or strips are influenced by the steering magnets and by means of pins engage one or other of the right and left hand worm gears which are mounted on a countershaft immediately ahead of this steering bar. The effect of engaging the pin with the worm is to force the entire steering (clutch) lever to one side. This in turn moves the clutch collar so that one set of dogs is released and the other one remains engaged. Thus; one set of tracks remains driven while the other set is disengaged and idles. Here is the method of steering and it follows in principle all tank and tractor procedure.

The magnets which actuate the pivoted steering bar attached (pivoted) to the clutch lever should be so mounted as to be within practical working distance of the steering bar. The magnets themselves can be taken from an old electric bell assembly. They are mounted to the frame on a sheet metal bracket as shown.

The motor should be hung as shown. Actual mounting details will depend upon the particular motor. That shown is based on the use of an old car ventilating fan motor, as previously explained.

The driving sprockets as well as the track sprockets are all cut from 3/32" metal (brass preferably) and the teeth should conform. Perhaps the easiest way to make these sprockets if one has lathe facilites is to cut them in series from metal rods of the required diameters and then saw off or "slice" the pieces with a hack saw.

All sprockets and the worm gears mentioned beforehand should be secured to the shafts with set screws after punching or lightly drilling the shafts to take the ends of the screws. In this way slip is definitely avoided and the full traction of the motor and tracks ensured.

The chassis is secured to the front plate of the body by means of a screw bolt extending from the front cross bar of the chassis; by a flat spring brace from the clutch collar to the front plate (this is really a guide brace for the collar and not an attachment point on second thought) by a lug from the right side of the motor to the body (side "A") and by the fact that the front drive sprocket shafts pass through the body sides and thus form a means of attachment there.

Six metal truck frames, bent to shape as shown, is the next step; following these the wheels, turned from solid stock centered in the chuck and completely finished, one at a time. Turn the outside to size, then the shoulder, center the wheel and drill slightly larger than the bushing. The plate on which the rear sprockets are mounted is held on by the tension of the treads themselves; adjustments can be made by turning in the long screws which are threaded through the rear axle. Nine square inches of bakelite or hardwood 3/8" thick will furnish enough material for the tread links. Cut up stock in strips 3/4" wide and groove through the center for the chain. Then cut them 3/4" long. Saw the teeth on the outsides, and drill through the centers for 3/4" No. 18 brads.

The firing gun, the automatic cannon is simply operated. A pivoted hammer strikes the shell to send it on its way. This hammer is actuated by a flat spring; any pieces of clock spring will serve. When cocked, the hammer is held by a small lever which is tripped by a small magnet as shown. Cocking for re-arming is achieved by means of a cocking lever or arm mounted on one of the sprocket shafts. Thus when the tank is in motion the cocking lever turns and in turning strikes and presses the hammer lever into the cocked position where it is held by a trip arm which is controlled by the magnet.

Last of all comes the control box, made as indicated in the drawings from plywood or 1/4" walnut. Round all corners and cut a long slot for the rheostat handle. The transformer is a standard electric train model having four connection posts, two for variable speed and two for a straight 13 volts. A terminal board was used to connect the wires so the cord could be removed when required. A battery cable having six small stranded wires carries the current and controls the tank. It is available from radio supply stores.

A piece of fibre turned on the faceplate and drilled in four places with a 3/4" drill makes an excellent steering wheel. The wheel is mounted at an angle and kept in neutral position by a piece of spring wire. A small toggle switch serves for the lights, and a button switch for the gun.

Build with blueprints. MECHANIX ILLUSTRATED conducts a blueprint service for the convenience of its readers. You will find a partial list of available plans on page 149.

Your Wartime Car

by Frederick C. Russell

If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope for personal reply to your letter.

What would cause high oil consumption suddenly? There is no leakage around the case or the valve compartment. W. D. N.

The gaps of the piston rings in one of the cylinders may have lined up.

Try it!

Tire beads that stick to the rim are apt to be injured during dismounting. Prevent this by applying a little vegetable oil soft soap to both the inside and the outside of the tire beads. Use a little graphite on the rims. Do not, however, use petroleum oils or greases on these parts.

It seems to be more and more difficult to keep my car to the center of a crowned road. Parking is difficult, too. Alignment is correct and everything is well greased. F. M. B.

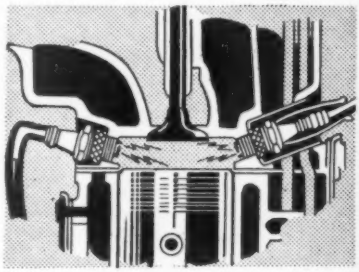
Turn the steering wheel and watch the gear housing. If it moves up and down a little it is loose where it bolts to the frame.

There are holes in the sides of the distributor head on my car. Are these for oiling? N. B. O.

No. They provide ventilation. Air draws off moisture which causes high tension shorts.

I recently purchased a used car which has twin ignition. No instruction book with the car. Are both plugs of each cylinder timed to fire together? L. Mc. K.

Yes, the idea is to fire the mixture at both sides of the cylinder, providing more complete combustion.



When going uphill the car has a tendency to buck. Several garages have been unable to check this. F. J. N.

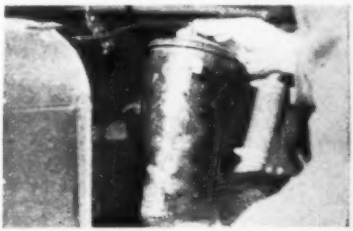
There is not sufficient valve tappet clearance to take care of expansion when the valves heat up.

I have trouble re-starting the engine when it is hot. There is no hand control of the throttle on this car. K. C. C.

Press the starter pedal with the ball of your right foot and hold your heel on the accelerator. Or use both feet to do the job. The idea is to crank with the throttle wide open. Don't choke. Don't pump on the accelerator.

I have been told that you should change the oil filter more often if the air filter isn't serviced regularly, especially in summer. How come? Wm. L. K.

The idea is that the more dirt is drawn in through the intake the more grit will get down into the crankcase. It is a good idea to keep both filters in good condition to prolong the life of the motor and eliminate trouble.



Mechanistic Monsters

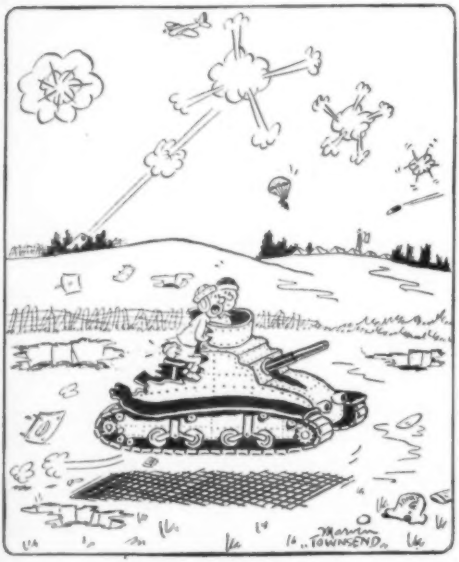
[*Continued from page* 91]

cannon and grotesque sky-sweeping plane-traps that make the air hideous.

To show to what lengths future measures may go in an effort to control war planes, the Californian draws fantastic weapons and traps like those in the bottom illustration on page 91. The bulging cannon hurls aloft an airplane trap operating on the principle of a multiple bolo. The weighted cord would wrap itself around the plane and the big weights would smash the craft to pieces. A contraption nearby is a thunderbolt maker which creates artificial lightning, shattering any metal machine within striking distance. A third device in the same illustration, rather restrained for Spohn, is a dispersing tower for a balloon plane trap. From lines joining the balloons at various levels are suspended great hooks which, he says, would snare aircraft like fish.

Other products of his imagination which Spohn has transferred to canvas for the fear of his fellow man include giant pterodactyl-like machines that fly through the air swinging huge metal balls on cables, machines with centipede feet, tornado suction devices, and machines that melt, pulverize, macerate, claw, squash, and burn up the enemy. (Perhaps the artist looked up synonyms for *destroy*, then dreamed up machines to fit.) Some of his contrivances are actually worked out with detailed diagrams. Several have been submitted to the United States War Department, which is somewhat nonplussed by them, however.

In any case, it's certain the artist's paintings would horrifically impress one person—psychotic Hitler, who's always hated modern art.



"Do you feel a draft?"

Are You A "Freudy-Cat?"

[*Continued from page* 43]

tongue lies silent in the grave, . . ." This song gave the child a vivid picture of her mother in a coffin and a horror of death, unfelt before. Another girl of 7 had a morbid terror of death from saying her nightly "Now I lay me down to sleep, . . ." and each night suffered terrors of Hell and Judgment Day!

People with Batophobia are in constant terror of falling objects. One such woman could never enter a store with a big sign over the door for fear it would fall on her. If it swung or creaked, the fear was even greater. A 46-year-old man could never sit under the chandelier of a theater, nor under the front of a balcony for fear that things might drop on him. A 16-year-old girl was never able to sail past the Palisades on the Hudson without fearing they would fall.

A 9-year-old girl, stricken with Ommaphobia, feared the bureau where an uncle kept his glass eye! Another, a victim of Odontophobia, feared the false teeth which her grandmother kept in a glass!

Fears, terrors, nightmares . . . silly when you analyze them, yet maddening to those afflicted by them. However, they can be cured, and the remedy lies in the mental powers of the individual. He must develop a control over his imagination and force it away from the terrifying pictures it tries to dwell on. He must concentrate, instead, on how silly and groundless his fears are, and how easily they can be overcome. Little by little, he should subject himself to the situation he fears and discipline his imagination. Just as some people can force themselves to endure pain through mental control (because they fear being called "sissies" more than they fear pain) the phobia victim can overcome his fears by using a "counter-fear" of public opinion to concentrate on in disciplining himself. The assistance of a good psychiatrist should be sought in extreme cases. It's a tough battle to beat your own fears, but it can be done, and it's worth it!

Cutting Interference

[*Continued from page* 141]

ing frequency from the ground wave. Interfering air frequencies are another matter but for low powered transmitters up to around 100 watts it appears to do the trick.

For ten meters this amateur used 16 turns of No. 16 enameled wire on 1½" forms. For other frequencies it will be much a matter of experimentation. However, as a suggestion, try double the number of turns for 20 and 40 meters and up to 125 turns on each coil for squelching interference up to and including 160 meters. It's a case of "cut and try" but the idea has promise and any amateur can try it out and may do away with that ever present BCI, especially on the 160 and 80 meter bands.

[*Continued from page 73*]

gunner how to get the correct answer to these problems in the quickest time possible. Split seconds count here!

During the ground training, the student gunner spends many hours studying scale models of both enemy and friendly aircraft. He learns to recognize these instantly, regardless of position or angle of approach. A few seconds saved in identifying an approaching plane may mean the difference between life and death in actual combat.

Estimation of range is also practiced with model planes. Scale models are made to slide along a wire and by correlating the distances from the gun sights with corresponding ranges for life-sized aircraft a very accurate reproduction of aerial combat conditions is achieved—on the ground. The student gunner peers through his sights, notes the apparent size of the sliding model and then calls out his estimate of the various simulated distances.

Relative speed and direction of the target are estimated by the gunner in actual air-to-air firing practice. A camera gun and towed target are used for this work.

To provide sighting experience, the WAG sits in a full-scale rotating turret fitted with a gun that aims a beam of light at a moving model of a Nazi airplane. When the light strikes a photo-electric cell in the model's nose, a meter registers a hit and a bell rings to let the student gunner know he is on the target. It's the old "electric eye" put to war use again.

The Battle we looked at is warmed up now, so let's get aboard and go out over the line to see how an air gunner gets practical firing experience.

Climbing, we soon leave the air station behind as the powerful Rolls-Royce motor pulls the Battle through the sky at 200 m.p.h. to 3,000 ft. In a few minutes we are out over Lake Erie, about two miles offshore, and circle while awaiting the drogue or target plane. Prior to actual air-to-air firing practice the WAG puts in several days at camera gun exercises. In these exercises two aircraft with gunner crews participate, each alternating as the target plane. The gunner aims his camera gun at the aircraft weaving around the tail of his own plane. Each time he presses the trigger of his camera gun a photo is taken of the target plane. The developed pictures will show whether or not he scored any hits. These exercises have prepared the WAG for aerial work with "live" ammunition.

Hah! There's the drogue aircraft approaching now. I'll continue circling until he nears us and then zoom up so as to secure a position abreast of him with our gunner aiming his gun outwards toward the lake. No shooting inland—there are homes there.

There—we have the drogue in position now. See—he's streaming the drogue (a long linen sleeve) which is the target for the gunner to aim at. It is attached to the target plane by a 1,000-foot cable and although twelve feet long it appears to be only the size of a human thumb from our position. There's the signal to open fire—a lamp flashed by the crew of the target plane. We are all set, so I give the gunner the command "OPEN FIRE!"

Br-r-r-r-r-rt. That's the machine gun's chant. It fires at a rate of about 1,100 rounds per minute, but the gunner fires in short bursts only. He is trying to group his shots on the target rather than have them hit "Indian file." It is concentrated fire that does the trick in aerial warfare, not the stringy type.

We are nearing the end of the line now, so I command the gunner "CEASE FIRE!" He must not be firing as the target plane banks and turns for another run up the line. There's a time during the turn when the target is in line with the towing plane and the gunner's shots would be likely to "creep" right up into the pilot's cockpit with disastrous results.

The target plane has straightened out for the return run now, the gunner can open fire again. Usually two gunners are aboard, necessitating the use of red-painted bullets by one so that it can be determined how each scored on the drogue. The red-tipped bullets leave their mark on the target sleeve as they pass through it. However, since only one gunner's aboard on this trip he is using plain-tipped bullets.

The exercise described is the simplest of all, inasmuch as a steady position abreast of the target is merely maintained while the gunner blasts away. Before the WAG completes his course he will have participated in a sequence of maneuvers designed to teach him to shoot calmly, quickly, and *accurately*. During these later exercises the target will be in many positions relative

[*Continued on page 163*]

THE JAPS SAY . . .

***"I shall not be content merely to capture Guam and the Philippines and occupy Hawaii and San Francisco. I am looking forward to dictating peace terms to the United States in the White House at Washington."*—Admiral Isoroku Yamamoto.**

AMERICANS SAY . . .

Are we going to stand for this? If not, the only way to prevent it is to buy those War Bonds and Stamps—and buy 'em and buy 'em!

Let's go, America!

Less Work Washing Clothes

[*Continued from page* 139]

to the pleasure of any outing, and is easy indeed, once the knack is acquired.

Washing clothes should be a daily occurrence so far as possible—never postponed more than one or two days, according to circumstances. There's a lot of satisfaction in knowing that one is not toting any soiled linens or outer clothing in the pack, and that a change to fresh things is always instantly available.

We may take a lesson from the Navy, which through the years has brought cleanliness down to a very fine point. The sailor scrubs his "skivvies" (undershirts and shorts) daily, and his "blues" once a week, either flat on the deck, if aboard ship, or on wash racks—flat sloping tables —if in training station. His sole equipment is generally a "ki-yie"—a stiff bristled brush about 8 inches long, a bucket of water, and a cake of soap. His white cottons are always glistening white, and his blue woolens never shrink, despite the primitive methods employed.

From this *modus operandi* the camper may take a valuable lesson. It is usually easy to locate a small log or tree—say 8 inches or so in diameter, so that one end lies in the edge of a stream. If not already there, a few minutes judicious work with the axe will put one there. Peel the bark off smoothly for a length of three or four feet, and use this smooth surface for a scrubbing table. Figure 1. Only a few minutes are needed to scrub several suits of underwear, handkerchiefs, etc., using plenty of soap suds, and rinsing frequently in the stream. Wring very dry after making sure that all soap is rinsed out, and hang on branches to dry in the sun and wind.

Woolen shirts, underwear, sox, etc.—even sweaters and blankets—are easily handled in the same manner. When washing woolens, leave a slight trace of soap in them, and *never wring them*. Hang them up dripping, to dry very slowly . . . they will be very soft and fluffy, and there will be no shrinkage. NEVER use hot water on woolens. Cold, or just warmed by the sun, is the thing.

The "ki-yie" or scrubbing brush takes up but little room in the kit, and is worth many times the small space required. Powdered soap, though excellent for camp use, is too bulky, besides the ever present likelihood of the package breaking open and messing up the outfit. A better way is to carry hard cake soap—a good naphtha soap is best— and shred it as needed with a fish scaler, or an old 8-inch butcher knife with its edge serrated as shown in Figure 2. This notching is easily done with the "knife-edge" file which should be a part of every hunter's and camper's outfit. Besides shredding soap as needed, such a blade is superior to a plain blade for slicing bread, bacon, fresh meat, or vegetables—and the edge of the blade may be kept effectively sharpened by a few strokes with the flat side of the file.

If your camping outfit does not include some sort of pail, one will sometimes be available at the camping site. And with a bucket, *plus* the "thunderbird" shown in Figure 3, you have a highly effective washing machine. Two smooth wood discs, about 6½ and 7½ inches in diameter respectively, are made of any clear white wood, though cypress is best as it does not split and crack from wetting. Several 1-inch holes are bored at varying angles, and the center hole is made slightly larger in the larger disc. These discs pack into little or no space in the outfit; and when needed for use, are easily fitted to a handle cut from a small sapling, with end whittled to a taper so that the larger disc stands about 2 inches above the smaller.

Drive the discs tightly onto the handle so that the holes do not come exactly opposite each other. Put the day's wash into the pail with clean water and plenty of shredded soap, then use the "thunderbird" like a churn dasher—moving it up and down and at the same time rotating it slightly —also lifting and turning the clothes occasionally as you proceed. It is amazing how snowy-clean a wash you can turn out in a very short time by this simple method and with very little effort. Rinse cotton goods, khaki, etc., through several waters until all soap is removed. Knitted woolens should never be wrung—just pressed lightly, and stretched out flat to dry in the shade. Wash daily —everything that is even slightly soiled—and the job will soon lose its terrors. Above all, wash all sox daily, and wash them thoroughly—a camper, hunter, or hiker is only as good as his feet . . . and his feet are only as good as his sox!

Save That Cigarette

[*Continued from page* 139]

hardwood. Hole in the short portion should be just 1 inch in depth, 13/32" in diameter at opening, and tapering at bottom, so that cigarette will be instantly extinguished. The cap should be an easy push fit so that cigarette may be protected when the gadget is dropped hastily into shirt or jumper pocket.

If some enterprising chap wants to turn them out in quantities and pack them in dozens on display cards—I'll wager the canteens and ships service stores can handle them.

A process for making artificial wool from peanut meal has been patented.

It is well known that cuckoos settle down in other birds' nests, but an ornithologist now says that each female cuckoo chooses a single type of bird as host, and her eggs tend to resemble those of the nest owner.

[*Continued from page* 161]

to his gun—ahead, behind, up, below, or rising and falling.

After he has completed the exercise, his allotted number of shots having been expended, I inform the target plane pilot by banking the wings from side to side. He acknowledges my signal by dipping his wings. Now he is "peeling off" and is descending toward that big field along the shore where he will release and drop the target. It will be picked up by a ground crew who will examine the linen sleeve and note the hits scored by our gunner. The target plane will climb back "on the line" and stream another linen sleeve for the next gunnery plane to fire at.

Did you get a kick out of that exercise? Well, here's another—we've headed for the water targets and we'll use only 500 feet of height. We are close to shore so you'll get the sensation of speed as I whiz along at 210 m.p.h. while the gunner prepares his gun for action again.

Over the water target range now. See those five squares in the water off to the left? It is the gunner's job to try and blast them as we fly by. Again he is shooting outward toward the water so as to miss the summer cottages along the shore.

That was just a practice run over the targets to show them. The next time by, the gunner's told to "Open Fire!" There's the familiar br-r-r-r-r-rt. He is again firing in short bursts, trying his best to group his shots on each target, as he did at 3,000 ft.

Five runs over the water targets and the gunner has used up his ammunition. Yep—there's his voice on the inter-cockpit phone—"Exercise completed, sir." Back to the air station now, via a climb back to 3,000 feet.

There's the station below. Another Battle is getting ready to take off. Every flight is on schedule, as at all gunnery schools. One plane is ready for takeoff as the other arrives home. There is no delay (there's a war on) and woe is the lot of the pilot who scrambles up the schedule. If an exercise is completed too early, hovering over the airport is necessary until the exact time for our landing.

Our Battle is down now and taxied to the flying line. The ground crew swarms over the plane, preparing it for the next pilot to take out. Gas, oil, ammunition are re-supplied.

That about sums up the training of an air gunner, but don't think the WAG is finished when he leaves for overseas. He has still to put in hours of combat training at an Operational Training Unit when he arrives over there. He'll learn how to operate one of the famous four-gun revolving gun turrets with which most bombers are equipped.

The revolving gun turrets are hydraulically operated. A flip of the gunner's wrist and the turret is made to revolve in any direction with ease and speed. Trips in the gun handles serve to elevate or depress the weapons. The entire turret swings like an observatory dome, enabling the gunner to spray bullets like water from a hose. Every fifth cartridge is a tracer which leaves a thin trail of white smoke, enabling the gunner to correct his aim.

The air gunner you flew with will have a good chance of obtaining a commission as an officer. He will be a sergeant when he graduates. About five percent will get commissions in Canada while another fifteen percent will be commissioned on arrival in England. This does not compare as favorably as the percentages of observers and pilots who receive commissions. That doesn't bother them. Remember the boasts of the gunners' theme song with its truth-speaking line: "It takes GUTS to be a gunner!"

In next month's issue

Major ALEXANDER P. de SEVERSKY forecasts the AIRPLANE of TOMORROW

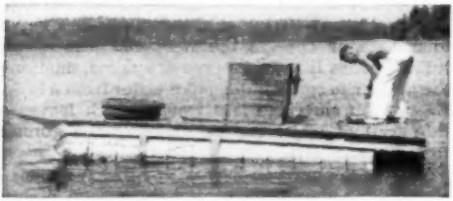
In an article of sensational interest and deep significance to everyone concerned with America's showing in the war, the famed author of *Victory Through Air Power* indicates the nature of aviation developments which in the coming months will decide the outcome of the global struggle. Don't miss "The Airplane of Tomorrow"—reserve your copy of the September MI NOW! Out August 5.

Major Alexander P. de Seversky
author of "Victory Through Air Power"

Fun On The Lake!—

[*Continued from page* 121]

laid out on the ground as near the water as possible, since the finished product is rather heavy to carry around. Next the 2"x4" cross members are spiked in place, and the 2"x6" braces on the front and back. It will be noticed that the front 2"x6" piece is cut at the center stringer. The two diagonal pieces forming the bow are then placed and lo, we have the completed skeleton. Now the oil drums should be painted and the sheet metal bands and end pieces made. The bands should be cut from 1/16" steel, while the conical ends may be made at home or built by your local tin smith from 16 ga. galv. iron. Although the drag was not found to be too serious on *Tubby* due to the lack of cones on the back drums, probably slightly greater speed would be obtained if they were added. After the cones have been welded or soldered to the drums (and this joint should be water tight), we are ready to start the final assembly job.



Tubby features ample deck area. Note how decking extends out over frame (three inches). Wheel is not connected.

The easiest way is to line up the drums in the water in their approximate positions, get a crew of enthusiastic friends, and by sheer power drop the frame in place. If, however, as is too often the case while a boat is being built, the enthusiastic friends are conspicuous by their absence, the drums can be popped in place one by one. The steel bands are nailed in place at the joints between the drums and the toughest part of the job is done. The engine bed is next, but specifications for this have been omitted, since they will vary with each case. In any event, they can be very simple, and the rugged 2"x6" frame of the raft can be used as the main source of support. We used a four horse power single cylinder "one lunger" bought second hand for ten dollars. While this isn't too classy, the results are very good, maintenance is very easy and economical, and a small engine of this type is recommended in preference to a larger auto engine. With the bed completed, the sheathing forming the deck is nailed in position. Too perfect a job is not desirable at this point, as cracks between the boards aid in drainage of water from wet bathing suits and the like. The box around the engine is there primarily to keep people out of the innards, and to cover up the mess brought about by the helter skelter accumulation of wire, batteries, and other accessories. Allowance has been made in the material estimate for the decks to give enough sheathing for the box, and it should be built and placed over the engine at this time. The back end of the propellor shaft is hung from a piece of sturdy strap iron lag screwed to the rear 2"x6".

If much swimming is done with the craft in motion, a wire guard should be arranged to protect the swimmers from the propeller blades. A diving board or platform can be added at this point, together with a boarding ladder, and any other personal details the builder may care to have. For a long time all steering was done on our *Tubby* with the aid of an oar, but finally a rudder was rigged up from a piece of sheet steel and a length of pipe. The steering wheel that is so prominent in the picture is from a model "T" Ford, and was placed there in the hope that some day the author would get enough ambition to connect it to the rudder, but to date the raft is still steered by the simple expedient of giving a lazy pull on the rudder rope. And now, after a coat of paint, all that remains is to crank up the motor, lie on your back, and enjoy the sensation of sunbathing in luxury while touring your favorite lake, or sitting comfortably in your pet chair, fishing and reading.

Material List

8 50 gallon oil drums. It does not matter what was in them, but they must be sound and tight.
4 fourteen foot pieces of 2"x6" pine.
1 eighteen foot piece of 2"x6" pine.
1 ten foot piece of 2"x6" pine.
2 eight foot pieces of 2"x6" pine.
4 seven foot pieces of 2"x4" pine.
1 eight foot piece of 2"x4" pine.
150 square feet pine sheathing for deck. (Includes enough for engine house.)
25 linear feet of 1/8"x3" steel for drum straps.
1 four foot by four foot sheet of No. 14 ga. galv. iron.
10 lbs. eight penny nails.
10 lbs. 16 penny nails.
5 lbs. 20 penny nails.
2 gallons paint.
Misc. hardware, lag screws, strap iron, pipe, ring bolts, etc.
This does not include materials for the engine bed as these will depend on the particular engine used.

Lillipuppets

[*Continued from page* 135]

the forward end of the controller. Nine strings are indicated, just the same as the conventional marionette just described, with the addition of strings to each shoulder. The shoulder strings are really one continuous length and run freely through a small wire loop fastened underneath the controller. These are adjusted first, then the head strings and back strings set just taut. The hand strings and knee strings are set evenly, but with ample slack. Operation is similar to the simplified string puppet already described, but to walk this one, the separate bar is removed from its pin, held slightly forward from the controller, and rocked up and down.

Part III of "Lillipuppets," describing construction and operation of the stage will be in next month's issue of Mechanix Illustrated. Be sure to watch for it.

Reverse Reflex Focusing

[*Continued from page 94*]

out a rectangle of cardboard in the center of which a round hole is cut. The latter's diameter is equal to that of the penlight used. Then, make a cardboard tube to accommodate the penlight snugly, and affix this to the rectangle over the hole. To the other side of the rectangle, cement a sheet of clear celluloid, and mark an "X" on it with black India ink directly over the spot where it passes over the hole. When the penlight is inserted into this adapter, the gadget can be laid on the ground glass screen of your camera, as shown in Figure 4. If it is constructed rigidly enough, it will stand in place without manual support. It is worked in the same manner as the searchlight attachment discussed above.

An attachment, that can remain in place without cutting off much of the ground glass image, is shown in Figure 5. As can be seen, this attachment holds fast to the ground glass screen by means of a rubber suction cup. The projection unit is secured to the suction cup and an extension wire, which connects it to the battery case on the outside of the camera, eliminates all unnecessary bulkiness inside the camera hood.

This projection unit is made from a small radio pilot light socket which can be obtained from any radio supply store. It is attached to the suction cup by means of a small extension bracket, (usually part of the socket itself). The socket should be mounted in an inverted position so that the bulb will point down at the ground glass screen. A loose fitting tube of cardboard or metal can be made to slip over the bulb. Over the bottom opening of the latter, cement a disc of celluloid with an "X" marked on it. Use a prefocused bulb in the unit.

Any small searchlight or penlight can be fitted to the outside of the camera to serve as the battery case for the unit. To connect the extension wire to it, make a small socket-type plug from a discarded searchlight bulb, by breaking away the glass and soldering the ends of the wire to the two inner wires in the bulb base, as shown in Figure 7. To insulate this, drip hot sealing wax over the soldered connections and inside of the bulb base, after which, wrap the sealed portions in rubber tape. This plug adapter can then be screwed into any searchlight socket in place of the original bulb.

To use this type of projection focusing unit, slip the tube with the "X"-marked disc over the bulb and secure the suction cup to a corner of the ground glass screen of the camera, as illustrated. The loose-fitting tube will drop to the ground glass where the "X" will lie flush against its surface. Pass the extension wire out to the battery case and switch the light on when ready to project the "X" for focusing. The light may remain lit while taking the picture without affecting the film, and if the suction cup used is a tiny one, the unit will not interfere with the camera's manipulation. To get a projection of maximum brilliance, focus with a wide open lens.

Correct Answers To Quiz On Page 78:

1. False. Argon is a gas.
2. True.
3. False. They are marine animals.
4. True. It is a modification of tin caused by extreme cold.
5. False. It is an instrument for measuring the speed of wind.
6. True.
7. False. A trench mortar is a type of short range weapon.
8. False. A pillow block is a kind of shaft bearing.
9. True.
10. False. A battery is made up of two or more cells.
11. True. It is a meteor with its radiant in the constellation Corona Australis.
12. False. Magnetic dip is the angle a horizontally free magnetic needle makes with the horizontal.
13. True.
14. False. It sometimes makes its nest in a scarecrow's pocket.
15. True.
16. True.
17. True.
18. True.
19. False. As many as 100 species of insects have been found living in termite nests.
20. True.
21. True.
22. True.
23. False. Adult penguins show great fondness for their young.
24. True.
25. False. A tool post is a part of a lathe in which the cutting tool is mounted.

Attention, MI Readers!

We will pay $1 for each true-false statement which we find acceptable. Statements will not be acknowledged or returned. Address the Quiz Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York City.

Checks have been sent to the following: Robert Maxton, Lansford, N. D.; Mrs. Ada Berkovitch, Porterville, Cal.; G. McKay, Pittsburgh, Pa.; Pvt. Frank A. Frazier, Pine Camp, N. Y.; David L. Penniman, Grosse Point, Mich.; Tony N. Jewell, Fort Bragg, N. C.; Bernice E. McWilliams, Bosworth, Missouri; John H. Spicer, Owen Sound, Ont., Canada; Allan Miller, Brooklyn, N. Y.; Andy Maxim, Barberton, O.

A metal yoke devised by a Polish-born boring mill operator at the General Electric plant in Schenectady cuts in half the time required for a vital step in building propulsion equipment for warships.

A "$2,000" Enlarger

[*Continued from page* 96]

adjustments is calibrated so expertly that prints made months apart from the same negative line up to within 1/200th of an inch. Impractical? Perhaps. But, handy if you are making a montage, doing double printing, or working with color separation negatives. These calibrations are made on celluloid strips held in place by screws and glue. These, of course, would be of but little use unless the rest of the camera's moving parts fit snugly, which they do.

But why describe this instrument piece-meal? To begin with, it has a telescoping base. When not in use, it closes to an over-all length of about 4 feet 10 inches, and will fit in a closet. When Halmer decides to make prints, he wheels the camera out into the kitchen and strips the cover from it with the same care and devotion that Sam Riddle might display taking a blanket off Man-O'-War. He turns a screw or two, tugs gently, and extends the camera base to an over-all length of 8 feet 6 inches.

Halmer estimates that it would cost $2,000 to build such a camera for the market, but it did not cost him more than a fraction of that sum. He bought rough materials and hand-worked them. He picked up odds and ends of virtual junk and made them into precision-fitting parts. The only workmanship that is not his is the frame on which the camera rests. This is Shelby tubing, a metal used in furniture construction, sawed, bent, and welded to his specifications. The rest of it he made himself—shaping and assembling odds and ends into his camera.

The light source is a commercial bulb held in a socket which accommodates various sizes. The light chamber is cooled by an electrically-driven, turbine-type fan. The air enters the light chamber behind the lamp and is vented through baffles. One rheostat controls the intensity of the light, another the speed of the cooling fan. In some of the difficult printing jobs undertaken by Halmer, he obtains his best result by making a long exposure with his light burning dimly and the cooling fan operating only fast enough to prevent excessive heat.

The housing for the light is a combination of junk and carefully hand-worked metal. The junk is salvaged motion picture film cans held in place by the pressure necessary to fit them over the end of the metal housing. At the front of the housing, ahead of the condensers (they and the ground glass are easily inserted or removed through a large hatch) is a negative holder also fit into a motion picture film can. Gentle pressure will move the negative holder into the various conventional positions.

A work light is fitted to the side of the enlarger. It is controlled by a separate switch, and illuminates two small drawers beneath the camera, which Halmer finds convenient for the storage of

[*Continued on page* 169]

For Better Planking

[*Continued from page* 122]

enough forward to work out around this and fill in the space. (Fig. 1.)

In buying planking lumber do not pay a premium for extra wide boards because seasoning invariably develops a check along the center or where the heart of the tree was, making it necessary to lay out narrower strakes each side to avoid the defect. The best plan is to buy merely medium width boards which are more apt to remain perfectly sound after seasoning.

A good rule is to have planks as wide as possible below the waterline where the frame faces are apt to be flat, then narrower strakes above. Such wide planks can be spiled for two ways at once by having your spiling batten narrow enough to work between the edge of the plank already on and the mark put on the frame for the other edge, without of course, having to bend the batten edgeways. (Fig. 2.) One uses two pairs of dividers; one pair set to prick points a certain equal distance down from the top mark, the other pair set to give equal distances up at the bottom from the edge of the fastened plank. The batten is then removed and laid in the regular way on the board to be used, and the distances pricked onto it without altering the setting of the dividers.

Where planking must fit against a concave faced frame blocks used with clamps to prevent their marring the wood should be shaped as shown in Fig. 3 with a face more rounded than required in order to throw a hollow in the plank. At the turn of the bilge where frame faces are rounded, blocks should be shaped the reverse of this with a hollow instead of a rounded face to shove edges instead of the center of the plank in as pressure is applied.

Stout ribbands are a great help in planking. One can then use struts and wedges from a ribband above, or better still a car jack as shown, to shove the plank being fastened edgeways into place against the one already on and give a tight seam. (Fig. 4.)—*J. A. Emmett.*

Locating Bent Frames

[*Continued from page* 122]

A quick and accurate way to do this is to temporarily fasten a straight strip across the sheer ribband the distance out from a mould that you want the set of frames. About halfway down slip another strip through the ribbands and either plumb it from the top one or measure out from the mould as before, then fasten temporarily. Another strip held to touch both of these with its lower end bearing against any one ribband will give the point on that ribband to which the frame must be sprung. The angle of the stick is changed as one works from ribband to ribband.—*J. A. Emmett.*

Boulder Dam's great reservoir, which has been rising since 1935, is now about four-fifths full.

Bike Turn Signal

[*Continued from page* 105]

into position. Unless the builder has sockets for the bulbs, their use is not urgently needed. We simply solder the connections to the bulbs with heavy bare copper wire and use a few small staples over the wire in setting the lamps in place. The one wire is soldered to the middle of the bottom of each bulb base and the other wire is soldered to the side. Care should be taken to see that the wires are firmly set and that there is no danger of opposite wires coming together before the cover piece is screwed into position. It is also well to recall here that bicycles go over bumps and are subject to considerable vibration.

It might also be well to paint the case with top and bottom in place but minus the celluloid window. Unless this job is done without the window, it is apt to get smeared.

The young electrician will know that, since bicycles are used during rain storms, some protection must be provided for our wiring. Purchase a few feet of armored cable (smallest size) at the automobile supply shop. This is the waterproof variety used for lighting and ignition wires where they are apt to suffer abrasion. A hole is drilled in one side of the case and this is large enough to admit two cables of two wires each.

The complicated indicator is held to the rear mudguard by the aid of two 8 32 machine screws. It will therefore be necessary to drill two holes through the mudguard. The whole job can best be done by completely removing the member and setting the indicator in place and tightening the screws before re-assembly is attempted. A lock washer on each of the holding screws will help greatly in keeping the screws in place.

The single dry cell (large size) used for the bulbs may be merely painted and held to the bar wheel frame with rubber tape or you may make a wooden or metal case for it. If a case is not made, take the precaution of covering the terminals of the dry cell with rubber tape.

The small spring switches, one for each handlebar, have bases cut from hard wood or fibre. These are strapped to each handlebar near the grip with rubber tape and in such a way that the wire terminal on each one is covered with rubber tape for protection against rain and subsequent corrosion.

The switch lever may be cut from a small piece of sheet brass and this is given a permanent bend so that actual pressure will have to be applied to make contact. When the switch on the left handlebar is used, the arrow will in turn flash for a left turn.

There the armored cable runs along the frame, rubber tape may be used to hold it in place and prevent it from slipping.

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Name
Address

Practice On Can Covers

[*Continued from page 124*]

or Charlie McCarthy will hoot him off the funnies in patriotic scorn.

And the Hottentot and South Sea islander are going to suffer for these receptacles to make spangles to adorn their ears and noses—and other divers uses.

No longer perhaps, will we be able to stroll down through the pasture, along the railroad track, or past the city dump with the trusty .22—and shoot indiscriminately at old tin cans to be found lying about—as if placed there conveniently for our special use. What debt do we owe the old tin can for developing that "shootin' eye" and accuracy of aim for which the American sportsman and dough boy is noted—to stand us in such good stead now in our battle against the Japs and Hitlerian oppression—

The terrible thought comes to me—"What if there ain't going to be any more tin cans—?"

So in the agony of the night I think up this one about tin can covers for targets. Surely Uncle Sam won't begrudge us the use of a few tin can covers for use as targets. The bullets will only punch holes in 'em—so there will be no material loss—because we can bring them home again to show the folks what good marksmen we are getting to be—and then throw them in the metal, paper and rubber accumulation we are saving for Uncle Sam. Think of all the civilian rifle clubs that have sprung up all over the country using these tin can cover targets to learn the use of firearms for home and national defense—and then depositing them in the pool of scrap metal to be used for bullets, guns, tanks and airplanes to fight the war with—

In glee I jump out of bed to make a note of it. Once more necessity is the mother of invention . . . Once more fellow sportsmen and target shooters are safe—for no longer will we have to go looking for old tin cans to shoot at. Just have mother, wife or sister save and wash the can covers she cuts off so clean and round with the modern rotary canopener — and you will soon have all the targets you want in a variety of sizes; many of them coated with that soft golden lacquer which makes them better targets to shoot at in strong sunlight, than bright tin.

With a handful of these in your side-coat pocket you can go for a stroll or spin in the car with the .22—and with one or more of the target-support backgrounds shown in drawings on page 124-you are all-set to do your target shooting any time, any place—where the ordinances and safety will allow.

All you need to make the target-support background of either style is a piece of smooth thin board of the dimensions shown in the drawings—and some 2" diameter sticks for the leg-supports.

Background target-support shown in Fig. 1 has one solid post nailed to back of target-board—sharpened at lower end to stick in the ground to attain desired height of target.

The combination background support holding 5 targets, shown in Fig. 2, is a piece of 6" board, 27" long—with the two 24" legs bolted on back at ends—so legs can be folded up for easy carrying, or stowing away in the car. By using a washer and thumb nut on each bolt, you can tighten the movable legs in position in upright position, or when folded.

The tin cans in most common use are the No. 2 and No. 3 sizes—so I have used these sizes for illustration. But you can of course, use larger or smaller can covers, if you desire. To make the brackets to hold the targets—lay your can covers on the board-background in symmetrical pattern and draw a line around each one. Then drive 6 carpet tacks around the lower half of each circle just outside the pencil line—so can covers will slip in and out easily without binding. This done and you have a target background ready to use—on which it is an easy matter to take out the used can covers and slip in fresh ones as needed. I use some of the can covers plain. And on some I paint a small bull's-eye with black screen-paint or touch-up enamel. When the board-background gets pretty well shot-up—all you have to do is take the legs off and fasten them to a new piece of board.

If you have been used to shooting indiscriminately and at random at various objects you see on a stroll with the .22—you will find that a few shots on a good target in favorable light and at a known distance—will tell more than can be learned by haphazard shooting. And I think you will like the can-cover targets as a means toward becoming a better marksman.

"I have perfected an invisible substitute for clothes!"

A "$2,000" Enlarger

[*Continued from page 166*]

small gadgets. This light also illuminates a timer which is attached to an arm fitted to a socket in such a way that the timer may be tilted or moved through 180 degrees of arc for the convenience of the operator.

Also out of the ordinary is an attachment fitting over his regular lens which is a second enlarger in itself, lens and all. He designed it to use in printing from 35mm. film strips.

The base of this instrument, made from aluminum with a file, fits over the lens. It is hinged in such a way that 35mm. film strips can be laid over sprockets. Then, the lens of the attachment swings back into place and locks. Focusing is done by twisting the lens of the attachment and moving either the entire "head" or the easel.

This auxiliary unit is built with such precision that springs holding the film firmly in place still are loose enough to permit the sprockets to move the film, with each frame of the film in focus as it is projected upon the printing easel.

The focusing knob of his main lens board is conventional except that it moves the lens board over a calibrated strip. The board itself is vertically and horizontally adjustable, also over calibrated strips. The only unusual feature here is a ratchet by which the entire camera can be moved backward or forward. Halmer finds this an easier way to match prints for size, or to make reductions in contrast to the usual movement of the printing easel.

And speaking of easels, Halmer has gone into this in a big way. Not only does his move backward and forward in a conventional way, but it can be rotated 360 degrees by turning a screw; and another adjustment tilts it backward or forward over a calibrated arc. Set screws hold the easel firmly in position, once it is adjusted. The distortion correcting value of a tilting and swinging easel is obvious to those who have used one, if only once; and for those who have never used one, an introduction to it opens a virtually new field in printing.

A second set of drawers was built beneath the enlarger to hold extra printing frames, dodging devices, cut-outs and printing paper. Sometimes, when working on a complicated montage, where the task is particularly tedious, Halmer sets a portable radio into this drawer, turns it to a station broadcasting soft and soothing music, and proceeds sedately with his work.

Halmer, in addition to being a fine craftsman when he undertakes to build something, is a very well-known West Coast photographer. Some of his fame is due to his skill as a printer and the fine instrument he uses in making his prints. He says the swinging easel which enables him to elongate some of his figures has in certain cases, improved the final print to a point where it was far more valuable than the original negative.

Hence, the enlarger is easily "worth $2,000."

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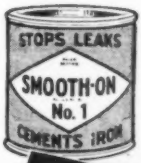

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Pneumatic Target Pistol

[*Continued from page* 125]

Bore from one end all the way. When the hole is complete, lap it carefully until a B B shot just falls through freely but with no real clearance.

The next task is to turn the barrel to the dimensions of Fig. 1. Counterbore the rear of the barrel 1⅛" deep and tap with a ½" No. 20 tap. Counterbore the rear of the barrel for ¾" more with a ⅜" drill. Now turn a piece of brass rod to a tight driving fit for this portion and drill a 5/32" center hole. With a taper reamer ream so that a B B shot falls halfway through and sticks. On completion drive this insert into the ⅜" counterbore, and check with a B B shot. The sights are now made for the barrel. They are turned out of brass or iron, filed flat and screwed into tapped holes in the barrel. See Fig. 2. Next make the plug for the rear end of the barrel as in Fig. 3.

The trigger chamber is now made. Again, careful work is called for. It is made as per Fig. 4 of ⅝" stock. The valve (Fig. 5) is made of steel, preferably, and ground to a perfect fit, the valve stem being lapped into the valve chamber. A satisfactory but shorter-lived valve may be made of a piece of rubber tubing slipped over a brass valve and cemented into place. The release for the air is connected by a threaded nipple made of ¼" iron threaded ¼"x28 and drilled with a 5/32" hole. This nipple is screwed into the air release hole of the trigger cylinder and into the rear chamber of the gun barrel. For permanence these may be brazed or soldered into place. Clean iron solders with a hot iron and good flux.

The supply chamber is made of ½" brass pipe turned out inside until the walls are about 3/32" or 5/64" thick. The ends are plugged and held with rods through the plugs. These ends are now carefully soldered in place, air tight. Connect the supply chamber to the trigger cylinder with a ¼" nipple as you connected the cylinder to the barrel—Fig. 1.

In order to get pressure, the pump is made of ⅝" brass pipe 6¾" long. A pipe cap is fitted on each end and turned down to eliminate weight. A bicycle tire valve is placed in the bottom of the cap as shown in Fig. 1. This in turn is soldered and threaded to the connection into the supply chamber and the pipe cap soldered to the supply chamber. The pump can now be completely disassembled for the replacement of the foot valve in case of leaks. The cap on the other end of the pump is bored for a 3/16" rod, a knob fitted, and a leather plunger with a washer for backing fitted for the other end. Care must be used to see that the pump cylinder is screwed clear to bottom of the cap so that the plunger can be pushed all the way to the bottom of the cylinder. The trigger is sawed from ⅛" material and the guard is made from 1/16"x¼" brass.

When completely assembled, make the handle out of pieces of ¼" wood tacked together and glued with casein glue. The open sections are filled with plastic wood and then the whole assembled unit is carved and sanded to shape; the trigger mounted, the guard placed, and the whole gun is ready for use.

The sights are adjusted by filing to the right height as you shoot the gun at a distance of 10 feet. Adjust the sights so that a full sight shoots ¼" high at 10 feet on a standard air rifle target.

Concrete Fence Posts

[*Continued from page* 129]

dipping, to discourage warping and sticking. Old crankcase oil will do.

Reinforcing rods ¼-in. in diameter run lengthwise the posts, and should be no closer than ¾-in. to any surface. Rods usually are placed as shown in the cross sections of posts. When posts are long, the rods will sag in the forms. They can be supported, until the concrete stiffens, by means of wires or strings tied to a blocked-up crosspiece resting on the side pieces or dividers. When the concrete has become rigid enough, cut the wires or cords close to the surface, push the ends out of sight, and smooth over the holes. A spacing block with properly positioned holes, placed at one or both ends of each post cavity, will make it easy to locate the reinforcing rods quickly. The blocks should be arranged so they can be removed after the rods are surrounded by concrete, and the spaces left by them filled to cover the rod ends.

Let the concrete set in the forms for at least 24 hours in warm weather, longer in cold. Remove each post carefully, cover it with straw or sand, and wet it down every 12 hours for 10 days. Then allow it to cure for 1 to 3 months before setting it in position.

Posts may have any kind of cross section that is conveniently produced with the forms at hand. One of the simplest fence-post shapes has two sides with a uniform width of 4-in. and two sides tapering from 5-in. to 3-in. in a length of 7 or 8 ft.

Various fittings can be imbedded in clothesline and similar posts as they are cast. A hook or ring threaded to receive a nut usually can be removed if the threads are first coated with hard grease and the nut run part-way on before embedding the threaded end. A hole can be made in a post by a greased dowel stick or straight metal rod that is pulled out after the concrete has set enough to hold its shape.

Gate posts and decorative entrance posts usually are so massive that they must be cast in position in forms erected over holes excavated to a depth of no less than 3 ft. Decorative designs, numbers, and letters can be formed on the posts with molding-plaster casts. After the concrete has set, the plaster is chipped away.

Posts of colored concrete should be protected from direct sunlight while curing. Then they can be given a coat of magnesium fluosilicate or sodium silicate solution to set the colors.

Fifty-Cent Welding Outfit

[*Continued from page* 107]

connecting a short length of asbestos covered wire between the remaining socket terminal and the one on the small asbestos panel. Your friendly hardware merchant will probably give you a sample piece of asbestos for the asking, which is more than enough for the panel.

The welding outfit is now ready for use. First, connect the wire from the tongs to one of the terminals on the ballast box. Then connect a length of wire from the other terminal to the material to be welded. A battery clip on the end of this wire provides a convenient means of making this connection. But it should be attached to a clean area, free from paint or rust.

With the nichrome bowl heater inserted in the socket, plug the unit into a convenient outlet. Make a few test welds in order to determine whether the welder produces an adequate arc. If it does not, remove about an inch from the coil on the bowl heater and try again. Continue to reduce the resistance until a satisfactory arc is obtained, but do not shorten the coil to the extent that you blow fuses.

You will be surprised at the efficient manner in which this outfit produces strong professional welds on light gauge metals. It will even handle small cast parts if they are preheated with a blow torch.

In order to prevent the blowing of fuses, operate the welder on a circuit that ordinarily does not carry much of a load, and fuse this particular line with a 25 or 30 ampere size.

The ballast case illustrated was given a professional touch by use of black wrinkle varnish. This paint loves heat; in fact, the fine finish was achieved by taking advantage of the heat from the nichrome unit.

Tools In Action!

[*Continued from page* 103]

such as the Mazda Photoflash No. 6 can be used. For focal-plane shutters, broadpeak photoflash lamps specially designed for such shutters should be employed. Electrical-discharge lamps, such as the Kodatron, are used as for any moving subject.

The accompanying photographs, while not falling within the "trouble-shooting" category, show some typical shop and factory operations, and reveal some things that even the veteran mechanic may not have known; the "snapping" action of bristles in a buffing brush, for example. For the benefit of the camera-minded, these pictures were taken with a Miroflex 9x12 cm. cut film job at a shutter speed of 1/2,000 second, lens aperture F. 11 to F. 16. Lighting consisted of a Mazda No. 6, with Wabash Press 40 for backlighting where necessary.

A new splint for broken wrists is made of transparent plastic and is described as almost invisible.

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Knots For Nylon Leaders

[*Continued from page* 138]

two turns on each side of the loop, instead of but one as shown.

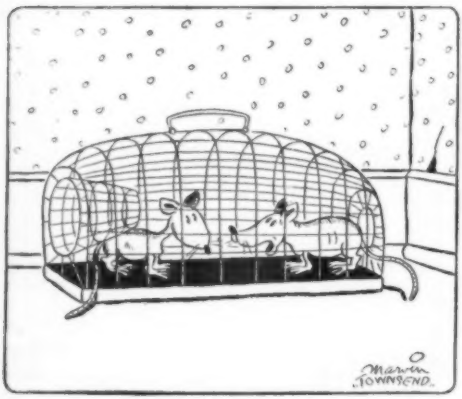
A TUCKED SHEET BEND knot is used to fasten a line and leader together. It is easy to untie, and the end of the line points toward the lure in such a way that it will not catch the leader when casting. Although this knot is easier to untie than others used for the same purpose, it is not necessary to remove Nylon leaders except when you want to change one for another. Nylon, unlike ordinary gut, is not damaged by moisture, and can be left on the line and wound on the reel.

1. First make a loop in the leader. Pass the end of the line through and around the loop, and bring it under the part of the line just inside the leader loop, as shown.
2. Bring the end down and back under itself.
3. Holding the end with the fingers, pull the line to close the knot.
4. This is the finished knot. The projecting end can be trimmed somewhat shorter than shown, and the knot pulled a bit tighter.

FIGURE EIGHT (For wet or dry flies). This knot, also called the Wemyss Knot, is used to fasten leaders to flies. It is easily and quickly tied. The steps are:

1. Run end of leader through eye of hook, and tie a loose Figure-Eight knot as shown.
2. With thumb and finger, pinch the leader end against the neck of the fly. Pull the leader until the knot slips toward the hook eye.
3. Push loop over hook eye so that entire knot encircles neck.
4. Pull knot tight, as shown.

RETURN KNOT (For wet or dry flies). Useful for fastening the end of a leader to a fly or to a bait hook, the RETURN is somewhat more difficult than the Turle or other knots, but is one of the strongest that can be used with Nylon leaders. In learning the knot, tie it on a hook as illustrated.



"Caught like rats in a trap!"

1. Run the leader through the eye, loop it around the shank, and bring it up in front. Hold the loop with your thumb and finger, and bring the end down behind the main part of the leader, near the eye.
2. Bring the end up and run it through both loops previously formed. Pull the line to take up the slack, and push the loops toward the hook, so they will tighten around the shank and not the line.
3. The finished knot looks like this. It is said to be the strongest of all hook knots.

BARREL OR LEADER GUT KNOT. This is an excellent knot for fastening two Nylon strands together. To tie it, imagine you have a light and a dark colored piece of leader to be joined:

1. Place the two leaders so they cross, and wrap the light-colored leader 2½ turns around the dark, bringing the end down between the strands as shown. Hold the pieces between thumb and finger, at A.
2. Still holding at A, wrap the dark-colored piece 2½ turns around the light one, and bring the end up through the opening between the strands, paralleling the first end but pointing in the opposite direction.
3. Release the fingers, permitting the turns to equalize themselves. Then draw the knot up tight and cut off the ends. The appearance will be as shown.

Occasional Table

[*Continued from page* 126]

a piece of tin to insure the same curve on both ends. The brace can be hammered to shape over the horn of an anvil or bent over suitable sized pipes fastened in a vise.

The brace is secured to the legs by means of a tie band of 1/16"x¾" strap iron riveted in place. Be sure the two ends are parallel and perpendicular to their base. A temporary fastening of the feet, 20" apart, to a board or base will aid in assembling the parts. If oxy-acetylene welding equipment is available the brace may be welded to the legs, in which case it is essential that the parts be rigidly and accurately clamped in place before welding. Fasten the legs and brace to the wood top with screws as indicated on the plan.

The metal parts of the table may be left unfinished or they may be given two coats of flat black paint, or they may be enameled or lacquered in colors. If desired, the metal parts may be pounded lightly, before assembling, with the ball end of a ball peen hammer and then polished lightly with No. 00 emery cloth to give a "hammered finish." Clear lacquer is recommended if the iron is to be left "natural."

The United States consumed more than two-thirds of the world's nickel production in 1941.

Give 'Em The Gaff

[*Continued from page* 109]

drawing. You may have to countersink the screweye hole a bit, or whittle a depression around it with a knife, to permit the ring to seat properly. Now reinsert the hook and spring the shank slightly to permit the spur to enter its hole. Drive the spur home with a hammer. Finally, bind 3 or 4-in. of the shank to the handle with stout cord or marline. The hook is now firmly anchored. The spur prevents twisting, and the screweye, which is not customarily employed with this type of mounting, prevents sidewise movement. If you happen to break the spur off or find that it is not sufficient by itself to hold the hook firmly, you can drill one or more small holes along the shank and drive nails or screws through them into the wood. This usually is not necessary, however.

Of course, you may carry only the hook on fishing trips, and fasten it to a handle cut from a tree. The same mounting technique is used, except that you probably will merely punch the holes instead of drilling them, and will not worry too much about splitting the wood.

The handle can be finished by applying lacquer, house paint, enamel, or spar varnish. It is not a bad idea to paint it some bright color such as orange or yellow, so it will be conspicuous in the boat or when dropped overboard in shallow water. A screweye in the end of the handle is handy for attaching a safety line. The hook can be finished by bluing it in the same manner as a gun barrel. This will retard rusting. A thin film of oil should be applied, especially when your fishing equipment is stored. Another way is to apply a coat of clear lacquer over the bluing, the metal, of course, being free of oil.

Since the point of such a hook can be dangerous if handled carelessly, it is a good idea to provide a safety cap for it, even when out in a boat and expecting a musky to strike any second. The rod size specified is just right to permit an empty 30-'06 cartridge case to be slipped over the point. Punch out the primer, run a stout cord through the hole, and tie a knot on the inside. The cord can be about 2 ft. long. Tie the other end to the handle screweye, or attach to it a large cork or fish-line float. The shell should fit snugly on the hook, but not too tightly. Apply a little oil to prevent sticking. Now when you want to use the hook, a yank on the cord will pull the cap off. Sometimes it may come with quite a bit of force; and to prevent injury to your hand, wrap electrician's rubber tape around the shell so it overlaps the end. The cork will enable you to retrieve the cap if it falls into the water.

The hook shown has a point that is approximately parallel to the handle. Some anglers may prefer the outward-curving type of point. There seems to be some lack of agreement over which is the better. But, since you are the hook-maker, you simply flicks yer wrist and bends yer choice!

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The Wonderful Tom Swift

[*Continued from page* 77]

positive have a mutual attraction for each other."

Mr. Swift "figured" that the negative electricity in the forward plate would pull the boat along (for "water is a good conductor of electricity"), while the positive charge sent to the rear plate would push it.

Well—it worked!

You can ask any of us who read the book thirty years ago. It took Tom Swift on one of the most wonderful adventures of all.

The race for $300,000 in gold in a sunken treasure trip tried his and the submarine's mettle. But he triumphed over "Mr. Berg" representative of another "powerful syndicate." Mr. Berg, too, had built a submarine to try for the "government prize" of $50,000. Mr. Berg, too, had learned through his wily ways that there had been a treasure ship sunk "off the coast of Uruguay."

It gave Tom a chance to try out the electric cannon mounted at the bows. And the chance, too, of trying out an ingenious ramming device to break open the gold-filled hull of the treasure ship.

Modern submarines don't ram other ships very often—but such occurrences have been reported. And there are several powerful "cannon" built into the bows and stern of today's undersea ships —even if they are operated by compressed air.

I often wonder if William Beebe's bathysphere was not inspired by a spark of memory planted by Tom and his deep sea adventures.

Beebe, if you recall, holds the record for the deepest descent ever made by man. His spherical metal chamber was lowered 3,000 feet into the

[*Continued on page* 175]

"Remember—I'll have no more ribbing about my building a boat in the basement!"

Professional Telegraph Key

[*Continued from page* 142]

then wire the upper contact point and insert the axle into the other post. The axle should be very firmly gripped by the sending arm so as to prevent slipping sideways yet fit just loosely enough in the posts not to interfere with the up-and-down arm movement while keying. Other details are clearly indicated in the illustrations.

Notice that the contact-point clearance is ⅛" to 3/16" with the arm always in a horizontal position. When these have once been set, variation in clearance is obtained by means of the leverage screw. The tension is adjusted likewise by variation of the pressure exerted upon the spring. Holes drilled for mounting allow the key to be permanently screwed down to a table, or on a "breadboard" with a buzzer or audio oscillator for code practice.

Drill Chuck Adapter

[*Continued from page* 131]

does hit the back of the blind hole it is necessary to very carefuly reset it before continuing this operation. After the tool has been reset it is a good idea to turn the lathe headstock by hand to make sure the tool does not tear the thread.

When you think the thread is finished, *do not take it out of the chuck*, but take the chuck off the lathe and try the piece on the headstock. It should fit easily and under no conditions should the piece be forced on the headstock. After the adapter fits on the headstock easily, it is screwed on and all the machining is done with it in place on the headstock.

The 4-jaw chuck is removed and the body of the adapter is turned down to the finished size and the end is turned down to ½ inch and threaded for 24 threads per inch to fit the drill chuck.

The last operation is finishing. If a knurling tool is available the body is knurled. Remember that the knurling tool should never be lifted until the knurling is finished.

In order to give that "Professional" appearance to the work the ends of the knurl are chamfered. The adapter may be used as is or it may be taken to a foundry and hardened.

THE JAPS SAY . . .

***"We shall always be able to mislead world public opinion."*—Baron Giichi Tanaka, former Jap Premier.**

AMERICANS SAY . . .

Are we going to let the little yellow so-and-so's mislead *us*? Not on your life! Buy more of those War Bonds and Stamps —buy till it hurts!

The Wonderful Tom Swift

[*Continued from page* 174]

depths of the sea where he observed strange, luminous creatures never before seen by man. Nor was his adventure as comfortable a one as Tom Swift's, reported thus wise by the author:

"They could hardly realize it, but the depth gauge told the story. It registered a distance below the surface of the ocean of five thousand seven hundred feet—a little over a mile."

Tom, excited, wanted to get into a diving suit and "walk about on land under water for a change."

But that was nothing! When the wreck was ultimately located—under two-and-a-half miles of water—Tom, in a diving suit, fought off a covey of "deepwater sharks" attacking his adventurous companion, Captain Weston.

The amazing thing about the wonderful young inventor's wonderful inventions is their habit of coming true—a quality due entirely to the perspicacity of Tom's creator.

Of course, Jules Verne's "Twenty Thousand Leagues Under the Sea" was prophetic. A score of works years ago cast detailed shadows of present day events. But no one man in the realm of fantastic fiction has been so consistently—and so prolifically—right in anticipating the mechanical wonders of today.

In our youth, he was a shadowy figure. If we thought about Victor Appleton at all we thought of him as a name at the bottom of an oval on the cover in which was imprinted "Tom Swift Among the Diamond Makers," or "Tom Swift and His Electric Rifle."

Actually, "Victor Appleton" was the late Edward E. Stratemeyer, the greatest producer of juvenile fiction in the world. He was born in Elizabeth, N. J., October 4, 1862 and died May 10, 1930 after having been responsible for the largest book sale on record. His "works" are still selling and new ones are appearing in 25- and 10-cent editions under the direction of his two daughters, Miss Edna C. Stratemeyer and Mrs. Harriet Stratemeyer Adams, who maintain the offices of the Stratemeyer Syndicate in East Orange, N. J.

He lived in the proper age for his work. The world and particularly America, was just awakening and rubbing its eyes in realization of the vast new world that science and invention were offering.

The Model T's were appearing in increasing numbers; the motorcycle was a machine of adventure and daring; steelclad ships were the pride of the Navy and the first airplane had been launched from an improvised platform on a cruiser. Distances were shortening and the promise of *speed*, evidenced in the occasional exhibition flights of the bamboo-and-silk kites built by young Glenn Curtiss, had fired the imagination of America's youth.

Is it any wonder that Stratemeyer named him

[*Continued on page* 177]

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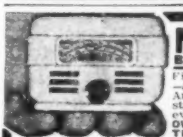

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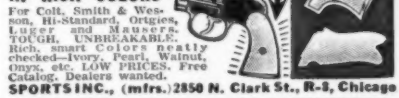

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The Art Of Damaskeening

[*Continued from page* 146]

compound, either oil or water-mix—it seems to make little difference. And, it seems to make little difference in final results on steel and iron, whether a coarse or fine abrasive is used. On silver, gold and other soft metals, a paste of fine pumice, rottenstone, rouge or Tripoly, in oil, is indicated, with, of course, either a soft bristle brush, or soft rubber cup wheel. The brushes or cup wheels are best for damaskeening uneven or cylindrical surfaces; the rubber-bonded abrasive sticks—or even a piece of wooden dowel rod are very satisfactory for flat surfaces.

Photo 1 shows a close-up of the Springfield rifle bolt (A), and of the exposed portion of the barrel of a National Match .45 Cold Automatic Pistol (B); and (C, D and E) flat surface finishes on Starrett Ground Stock. The full circle finish (C) is made by moving the work a distance equal to the brush's diameter, while the more intricate appearing finishes (D and E), are made by overlapping the circles. The larger pattern on the rifle bolt was accomplished by using the brush with bristles about ¼-inch long, allowing them to spread under pressure; while the smaller pattern on the pistol barrel was done after trimming bristles to about ⅛-inch in length. Variations of pattern are readily obtained by moving the work about under the brush in connected or overlapping figures, such as squares, triangles, diamonds, figure-8's or continuous, overlapping circles; and still further variations may be accomplished by turning the work so that but one edge of the brush strikes it.

This type of decoration is not only applicable to tool, die, and fine gun work; many a homeshop project of hammered or spun brass, copper, aluminum, etc., may be greatly beautified by this simple method, and the value of the work materially increased.

The soft rubber bonded material of the Weldon Roberts Company, of Newark, N. J., is the finest and most useful polishing compound I have discovered to date. It appears to be aluminous Oxide, bonded in soft red rubber, in the form of wheels, from $\frac{1}{16}$" thick by ½" diameter, to ½" thick by 5" diameter; and in sheets up to ¾" thick, and in sticks ¼" diameter, from 1" to 5" long, and in many useful forms, for polishing, buffing, cleaning off rust, etc.

A quarter-inch round stick of this material makes an ideal medium for damaskeening any metal, from the softest aluminum to the hardest steel . . . and this without the use of any abrasive paste. A very desirable feature is that the pattern being formed can be observed as it goes, since the surface is not covered with any abrasive paste. These soft rubber wheels, moreover, are ideally adapted to the polishing of all sorts of gun parts, and other small machine parts, since their edges or sides may readily be ground to any desired radius or contour.

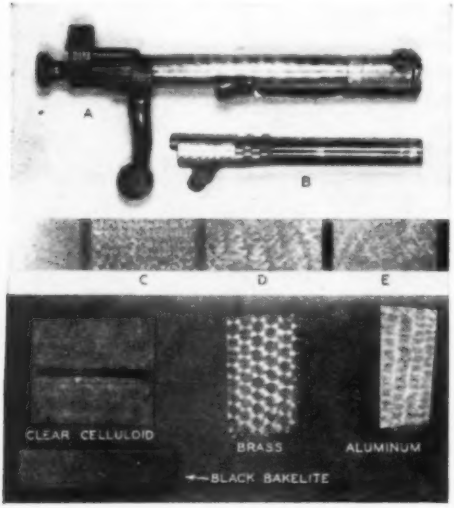


Photo 1, above: This picture shows how the damaskeening process may be used on various surfaces. Top is a rifle bolt and, below are different patterns easily achieved. See text for reference to letters identifying the objects.

Budget Desk

[*Continued from page* 143]

and outline the fence boards with brown. Fasten a hook and eye to one side of the desk to hold it closed when not in use.

By keeping grocery receipts in order in one of the compartments, much confusion can be avoided in maintaining records of purchases. If it is not used for this purpose it makes a handy holder for pot lifters and other everyday household items used around the kitchen.

Inexpensive indoor plywood can be used as the wall desk will not be exposed to the weather. White pine is satisfactory for the standard lumber parts.

It is a wise idea to include a pen type pocket flashlight among the accessories of the wall desk, so that it will be handy in the event of a blackout or current failure. Naturally, it should be used with discretion in a blackout.

ANSWERS TO QUIZ ON PAGE 145

1. Bubbles form on negative
2. (a) Butt; (b) Lap; (c) Strap Joint
3. Guns
4. Plywood. Grains of second and third plies should be at right angles
5. 1,090 feet

The Wonderful Tom Swift

[*Continued from page* 175]

Tom Swift? He couldn't possibly lose with such a typically short, American name. That baptism is evidence of the shrewd, simple genius of the author in his depiction of a real United States youth of the first quarter of the 20th century.

When newspaper reporters were writing over our heads "interpreting" events of the day and were granted a half column of adjectives to go along with a half column of news, Victor Appleton was giving us those events in a pill coated with excitement.

Before the Atlantic joined the Pacific in the Big Ditch cut through Panama, Edward Stratemeyer set Tom Swift to work devising fantastic defenses for the canal.

Tom Swift and His Giant Cannon hurled a two-ton projectile 33 miles. "The longest shot on record," cried the man. "Thirty-three miles and it struck, exploded and blew the top off a mountain on an island out there!"

It was Tom Swift who gave us our first knowledge of nitro-glycerine and guncotton when, in "inventing" a charge for his super-cannon, he hit upon a "terrifically powerful explosive."

Here's the description of the "longest shot on record" that held us spellbound and filled us with pride in knowing Tom Swift had done it again:

"Coincident with the pressure of Tom's fingers there seemed to be a veritable earthquake. The ground swayed and rocked, and a number of the spectators staggered back. It was like the blast of a hundred thunderbolts. The gun shook as it recoiled from the shock, but the wonderful disappearing carriage, fitted with coiled, pneumatic and hydrostatic buffers, stood the strain."

And Tom, for that longest shot, not only got his gun "accepted" by the government, but was rewarded otherwise. The longest shot on record had blasted the top off an island mountain revealing the shaft of a "lost opal mine." The very mine, mind you, being sought by a man whose expedition had been financed by the Swifts.

Well, it was no more than Tom deserved.

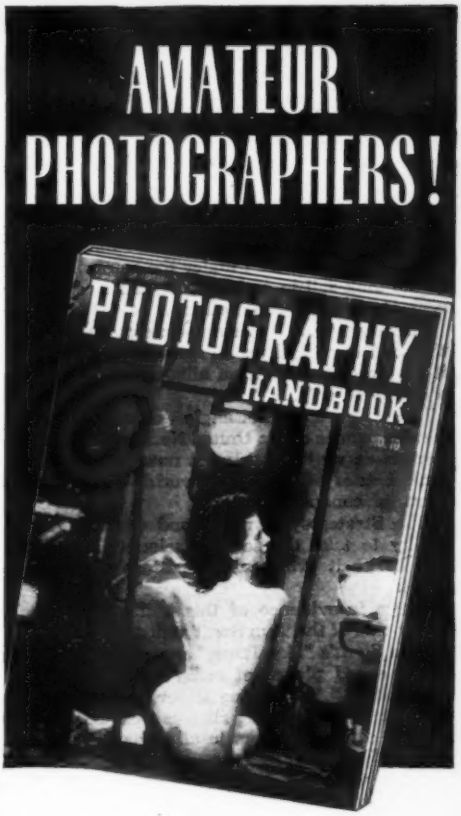
Today, if in his modern adventures Tom ever gets to the Canal Zone, or out on Sandy Hook—or on any U. S. defenses—he should be justly proud of the job his Giant Cannons are doing with the Army and the Navy, the Marines and the Coast Artillery.

World War I beat Tom to the punch on land battleships. It wasn't until 1918 that "Tom Swift and His War Tank" thrilled the youths that were later to watch the lumbering steel giants in newsreels from France.

But you couldn't get ahead of Tom. He had a new twist.

He saved his tank from destruction at the hands of "German plotters" by exercising "wireless control" over the machine with signals from his swift flying airplane.

[*Continued on page* 178]



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The Wonderful Tom Swift

[*Continued from page* 177]

Perhaps one passage from this volume will revive a picture you have seen in the last few months:

Tom was testing his tank and a ruined factory building was the test. He aimed it at the largest of the remaining walls.

"There was a crash as the blunt nose of the great war tank hit the wall and crumpled it up.

"A great hole was made in the masonry and what was not crushed under the caterpillar belts of the tank fell in a shower of bricks, stone and cement on top of the machine.

"Like a great hail storm, broken masonry pelted the steel sides and top of the tank. But she felt it no more than does an alligator the attacks of a colony of ants . . ."

The wireless control angle was new with Tom, but the armies of the United Nations and the Axis powers as well are using it now in their titanic tank battles all over the world—in a modified form, of course.

The Stratemeyers are proud of their father's ability to take the seed of scientific knowledge and make it grow into a pattern of things to come.

There is evidence of this ability in virtually every title of the Tom Swift series.

Tom Swift's "Sky-Racer" was a pattern for the super speed planes of today's war; his "Great Searchlight," the blazing finger of which probed the lair of a swindling ring, is cast today as the spotter of night raiders in all parts of the world.

His "Wireless Message" was radio prophecy and his "Photo Telephone" today flashes pictures to your newspapers across continents. His "Electric Rifle" as yet has found no practical existence, but "Among the Diamond Makers" he unearthed a formula that is in use today in the production of carbon crystals.

Tom Swift even gave us television—for a practical demonstration of which you can go to your nearest radio dealer—or could up until a few weeks ago.

During one period of Tom Swift's adventurous life, certain people dealt harshly with him and with Mr. Stratemeyer's books.

Apparently it was not so much Tom's inventions they objected to, but, rather, the things that these inventions led him into that brought the jaundiced looks. There was talk of "unreality" and the "effect on young, impressionable minds." Well, maybeso.

When the Nazis took Crete, was there anything about the attack that reminded you of Tom Swift? They used one of his inventions.

Ten years before the strategic Mediterranean island fell, "Tom Swift and His Sky Train" blazed a trail from coast to coast carrying passengers in four gliders attached to the tail of the "Eagle," Tom's big airliner.

Of course there was the usual "prize" at the end of the trail. There were the machinations of rival aircraft manufacturers and Tom's "wonderful" duo magnetic couplings that kept the gliders hitched to the mother ship.

At Chicago and Denver and San Francisco Tom cut loose gliders to soar gracefully to a perfect landing.

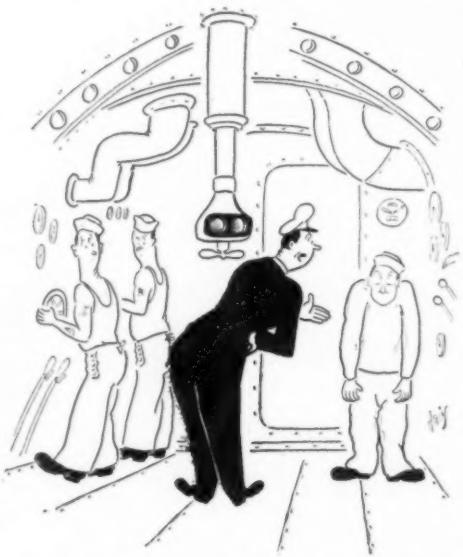
You all know the story of Crete and how troop laden gliders cut loose from transport ships to land on the little island, spewing death for the defenders.

Ah, but the Nazis haven't caught up with Tom yet. Tom's Sky Train had another angle. Not only could he cut loose his gliders, but he could *pick up* new gliders lifted to him by groundbased ships as he sped at unslackened speed over each airport—thanks to the magnetic couplers.

Let 'em try to match *that.*

Tom Swift and his adventures may have been bad for "impressionable, young minds." Maybe so. But I wonder to what degree he might also be responsible for the American kind of imagination and ingenuity—the kind of imagination and ingenuity that bombs Tokio four months after we are plunged into war without warning.

Anyway, we all used to think Tom Swift was wonderful! So did his sweetheart, Mary Nestor. And now, as Mrs. Tom Swift, she probable has plenty of trouble—getting Tom to come out of his workshop long enough to eat his dinner.



"Oh come, come—we all keep our eyes open under water."